evertz

7700
MULTIFRAME
MANUAL

Version 2.1
07/00

MASTER SYNC GENS

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7700 MultiFrame

Instruction Manual

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INFORMATION TO USERS IN EUROPE

NOTE

CISPR 22 CLASS A DIGITAL DEVICE OR PERIPHERAL

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to the European Union EMC directive. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

INFORMATION TO USERS IN THE U.S.A.

NOTE

FCC CLASS A DIGITAL DEVICE OR PERIPHERAL

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

WARNING

Changes or Modifications not expressly approved by Evertz Microsystems Ltd. could void the user's authority to operate the equipment.

Use of unshielded plugs or cables may cause radiation interference. Properly shielded interface cables with the shield connected to the chassis ground of the device must be used.

REVISION HISTORY

<u>REVISION</u>	<u>DESCRIPTION</u>	<u>DATE</u>
Preliminary	Preliminary Chapters	April 99
1.0	Initial release of individual sections: Overview, Selector Guide, 7700FR Frame, Fiber Optics System Design, Upgrading Firmware 7700DA-HD, 7705OE-HD,7705EO-HD, 7710MD, 7720AD-HD, 7720AE-HD 7700DA, 7705OE, 7705EO	June 99
1.1.	New release of various chapters and updated chapters 7700DA-HD, 7705EO-HD, 7705OE-HD, 7720AE-HD & 7720AD-HD	Sept. 99
2.0	New release of various chapters and updated chapters, 7750SRG-HD, 7720AD, 7720AE, 7700ADA, 7750TG, 7760AVM-LITE	May 00
2.1	New release of various chapters: 7721DD, 7721DE, 7700FC, 7730DAC-HD, 7732PFT-HD, 7760AVM and updated various chapters	July 00

REVISION HISTORY

REVISION	DESCRIPTION	DATE
1.0	Original Version	June 99
1.1	Added information on 7701 Frame and stand alone enclosures	Sept 00

1. OVERVIEW

The Evertz 7700 Series Modules provide solutions for today's vast digital requirements while at the same time providing the ability and flexibility to handle the high-speed requirements of high definition television signals both now and in the future. The system can handle a wide variety of signal formats and interfaces including analog audio and video, AES audio, standard definition (SDI) and high definition (HDTV) video with either coaxial copper or fiber optic interfaces concurrently in the same frame.

The 7700FR 3RU frame permits extraction of the modules from the front without compromising performance even at 1.5Gb/s. Thus, there is no need for time consuming re-cabling nor is there need to have access to the rear of the frame replace or exchange modules. This advanced rack frame design can house up to 15 modules of any combination of the 7700 series distribution, conversion, processing and synchronization. Special attention was provided to ensure sufficient thermal relief for up to 160 watts of processing power. Choose the number and the type of modules to meet your system design requirements today and if the future requires additional modules or a change of module to a higher speed upgrade (say HDTV) it is achieved via simple front loading.

The 7701 1RU frame encompasses the same design philosophy as the larger frame. This compact rack frame design can house up to 3 modules of any combination of the 7700 series distribution, conversion, processing and synchronization. Special attention was provided to ensure sufficient thermal relief for up to 60 watts of processing power. The 7701 frame contains a single power supply.

Many of the modules are also available in a stand-alone enclosure. Each stand alone unit is self contained and is powered from an external 12VDC source. A mains to 12 VDC power supply is included when you purchase the unit. These units are ideal where single module is required, or where 12 volt power is available in field applications. Stand alone units each have their own manual which consists of general information plus the relevant chapter from this binder.

1.1. HOW TO USE THIS MANUAL

This manual is organized in a modular format and consists of an overview chapter, and separate chapters for the rack frame and each module in the 7700 series. The overview section contains a short tutorial and glossary to define concepts and terms used throughout the remainder of the manual. We highly recommend taking the time to become familiar with the terms and concepts described here before proceeding into the rest of the manual.

The 7700 or 7701 Frame chapter will be included depending on the frame that you ordered. This chapter gives a detailed description of the rack frame and power supplies and gives general mounting and installation instructions. Each of the individual module chapters is a stand alone document that describes the function, installation, and operation of a specific module. Index divider tabs, used in conjunction with the selector guide chapter will quickly guide you to the appropriate part of the manual.

Items of special note are indicated with a double box like this.

1.2. GLOSSARY

1.2.1. Definitions

CCIR-601 (This document now known as ITU-R601). An international standard for component digital television from which was derived SMPTE 125M and EBU 3246-E standards. CCIR-601 defines the sampling systems, matrix values and filter characteristics for both Y, B-Y, R-Y and RGB component digital television signals.

SERIAL DIGITAL Digital information that is transmitted in serial form. Often used informally to refer to serial digital television signals.

4:2:2 A commonly used term for a component digital video format. The details of the format are specified in the CCIR-601 standard. The numerals 4:2:2 denote the ratio of the sampling frequencies of the luminance channel to the two colour difference channels. For every four luminance samples, there are two samples of each colour difference channel.

SDI An abbreviation for *serial digital interface*, this acronym is most commonly used to refer to Standard definition serial digital television video signals up to 540 Mb/s.

HDTV An abbreviation for *high definition television*, this acronym is most commonly used to refer to High definition serial digital television video signals at 1.485 Gb/s.

AES: (Audio Engineering Society): A professional organization that recommends standards for the audio industries.

AES/EBU: Informal name for a digital audio standard established jointly by the Audio Engineering Society and the European Broadcasting Union organizations.

ANALOG: An adjective describing any signal that varies continuously as opposed to a digital signal that contains discrete levels representing digits 0 and 1.

A-TO D CONVERTER (ANALOG-TO-DIGITAL): A circuit that uses digital sampling to convert an analog signal into a digital representation of that signal.

BIT: A binary representation of 0 or 1. One of the quantized levels of a pixel.

BIT PARALLEL: Byte-wise transmission of digital video down a multi-conductor cable where each pair of wires carries a single bit. This standard is covered under SMPTE 125M, EBU 3267-E and CCIR 656.

BIT SERIAL: Bit-wise transmission of digital video down a single conductor such as coaxial cable. May also be sent through fiber optics. This standard is covered under SMPTE 259M and CCIR 656.

BIT STREAM: A continuous series of bits transmitted on a line.

BYTE: A complete set of quantized levels containing all the bits. Bytes consisting of 8 to 10 bits per sample are typical in digital video systems.

CABLE EQUALIZATION: The process of altering the frequency response of a video amplifier to compensate for high frequency losses in coaxial cable.

CCIR (International Radio Consultative Committee)   An international standards committee. (This organization is now known as ITU.)

CCIR-601: (This document now known as ITU-R601). An international standard for component digital television from which was derived SMPTE 125M and EBU 3246-E standards. CCIR-601 defines the sampling systems, matrix values and filter characteristics for both Y, B-Y, R-Y and RGB component digital television signals.

CCIR-656 (This document now known as ITU-R656). The physical parallel and serial interconnect scheme for CCIR-601. CCIR-656 defines the parallel connector pinouts as well as the blanking, sync and multiplexing schemes used in both parallel and serial interfaces. It reflects definitions found in EBU Tech 3267 (for 625 line systems) and SMPTE 125M (parallel 525 line systems) and SMPTE 259M (serial 525 line systems).

CLIFF EFFECT   (also referred to as the 'digital cliff') This is a phenomenon found in digital video systems that describes the sudden deterioration of picture quality due to excessive bit errors, often caused by excessive cable lengths. The digital signal will be perfect even though one of its signal parameters is approaching or passing the specified limits. At a given moment however, the parameter will reach a point where the data can no longer be interpreted correctly, and the picture will be totally unrecognizable.

COMPONENT ANALOG: The non-encoded output of a camera, video tape recorder, etc., consisting of the three primary colour signals: red, green, and blue (RGB) that together convey all necessary picture information. In some component video formats these three components have been translated into a luminance signal and two colour difference signals, for example Y, B-Y, R-Y.

COMPONENT DIGITAL: A digital representation of a component analog signal set, most often Y, B-Y, R-Y. The encoding parameters are specified by CCIR-601. The parallel interface is specified by CCIR-656 and SMPTE 125M.

COMPOSITE ANALOG: An encoded video signal such as NTSC or PAL video, that includes horizontal and vertical synchronizing information.

COMPOSITE DIGITAL: A digitally encoded video signal, such as NTSC or PAL video that includes horizontal and vertical synchronizing information.

D1:   A component digital video recording format that uses data conforming to the CCIR-601 standard. Records on 19 mm magnetic tape. (Often used incorrectly to refer to component digital video.)

D2:   A composite digital video recording format that uses data conforming to SMPTE 244M. Records on 19 mm magnetic tape. (Often used incorrectly to refer to composite digital video.)

D3:   A composite digital video recording format that uses data conforming to SMPTE 244M. Records on 1/2" magnetic tape.

EBU (European Broadcasting Union):   An organization of European broadcasters that among other activities provides technical recommendations for the 625/50 line television systems.

EBU TECH 3267-E: The EBU recommendation for the parallel interface of 625 line digital video signal. This is a revision of the earlier EBU Tech 3246-E standard that was in turn derived from CCIR-601.

EDH: Error Detection and Handling (EDH) is defined in SMPTE RP-165 as a method of determining when bit errors have occurred along the digital video path. According to RP-165, two error detection checkwords are used, one for active picture samples, and the other on a full field of samples. Three sets of flags are used to convey information regarding detected errors, to facilitate identification of faulty equipment or cabling. One set of flags is associated with each checkword, and the third is used to evaluate ancillary data integrity. The checkwords and flags are combined into a special error detection data packet that is included as ancillary data in the serial digital signal.

EMBEDDED AUDIO: Digital audio is multiplexed onto a serial digital video data stream.

ITU: The United Nations regulatory body governing all forms of communications. ITU-R (previously CCIR) regulates the radio frequency spectrum, while ITU-T (previously CCITT) deals with the telecommunications standards.

ITU-R601: See CCIR601

PIXEL: The smallest distinguishable and resolvable area in a video image. A single point on the screen. In digital video, a single sample of the picture. Derived from the words *picture element*.

RESOLUTION: The number of bits (four, eight, ten, etc.) determines the resolution of the signal. Eight bits is the minimum resolution for broadcast television signals.

    4 bits = a resolution of 1 in 16.
    8 bits = a resolution of 1 in 256.
    10 bits = a resolution of 1 in 1024.

SERIAL DIGITAL: Digital information that is transmitted in serial form. Often used informally to refer to serial digital television signals.

SMPTE (Society of Motion Picture and Television Engineers): A professional organization that recommends standards for the film and television industries.

SMPTE 125M: The SMPTE standard for bit parallel digital interface for component video signals. SMPTE 125M defines the parameters required to generate and distribute component video signals on a parallel interface.

SMPTE 244M: The SMPTE standard for bit parallel digital interface for composite video signals. SMPTE 244M defines the parameters required to generate and distribute composite video signals on a parallel interface.

SMPTE 259M: The SMPTE standard for 525 line serial digital component and composite interfaces.

SMPTE 292M: The SMPTE standard for 1125 line serial digital high definition video interfaces.

SMPTE 299M: The SMPTE standard for embedding AES audio into SMPTE 292M serial digital high definition video.

TRS-ID: Abbreviation for "Timing Reference Signal Identification". A reference signal used to maintain timing in composite digital systems. (It is four words long in the serial data stream.)

4Fsc: Four times subcarrier sampling rate uses in composite digital systems. In NTSC this is 14.3 MHz. In PAL this is 17.7 MHz.

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TABLE OF CONTENTS

REVISION HISTORY

REVISION	DESCRIPTION	DATE
1.0	Original Version	June 99
1.1	Added 7705WDM, 7705DS, 7705MS, 7740DLY, 7760AVM series	Sept 99
1.2	Added 7740TMR, 7710MD-S, 7705OE-HD-L Added Modules by Model Number table	Oct 99
1.3	Added 7732PFT-HD	Jan 00
1.4	Added 7750SRG-HD HD Slave Reference Generator 7750TG SDI Test Signal Generator 7700ADA Analog Distribution Amplifier 7710MD-HSN HD Monitoring Down converter 4 HD, 2 SDI, 2 Analog outputs 7730DAC-HD, 7730DAC-HD-V, 7730DAC-HD-V-A HD D to A converters	Mar 00
1.5	Added 7700FC Frame Controller 7745FS SDI Frame Synchronizer 7745FS-HD HD Frame Synchronizer 7760 AVM-G, 7760 AVM-LITE Monitoring Deleted 7730DAC-HD-V-A, 7710MD-HAN Corrected model numbers for 7700DA10, 7700DA8-HD, 7705EO15-HD-L	Jun 00
1.6	Added 7700DA10-N Non-reclocking high fanout DA	Sep 00

1.   MODULES BY VIDEO STANDARD

The modules listed in this section are organized by Video Standard then sub-sorted by function

1.1.   HIGH DEFINITION TELEVISION PRODUCTS

Model	Description	Chapter
7700DA-HD	1.5Gb/s HD 4 output DA (non reclocking for 19.4-540Mb/s)	7700DA-HD
7700DA8-HD	1.5Gb/s HD 8 output DA (non reclocking for 19.4-540Mb/s)	7700DA-HD
7705OE-HD	Fiber to electrical converter - 1310 to 1550 nm MPEG TX rates up to 1.5 Gb/s	7705OE-HD
7705OE-HD-L	Fiber to electrical converter - 1310 to 1550 nm MPEG TX rates up to 1.5 Gb/s – high sensitivity	7705OE-HD
7705EO13-HD	Electrical to fiber converter - 1310 nm - distances to 6 Km MPEG TX rates up to 1.5 Gb/s	7705EO-HD
7705EO13-HD-L	Electrical to fiber converter - 1310 nm MPEG TX rates up to 1.5 Gb/s - extra long haul	7705EO-HD
7705EO15-HD-L	Electrical to fiber converter - 1550 nm MPEG TX rates up to 1.5 Gb/s - extra long haul	7705EO-HD
7705CWDM	Fiber Optic coarse wavelength division multiplexor/demultiplexor – Allows use of single fiber for transmission of four signals at different wavelengths	Future
7705DS	Fiber Optic Distribution Splitter – Splits signal to two signals of 50% power	Passive Optical
7705MS	Fiber Optic Monitoring Splitter – Splits signal to two signals of 80%/20% power	Passive Optical
7705WDM	Fiber Optic wavelength division multiplexor/demultiplexor – Allows use of single fiber for transmission of two signals at different wavelengths	Passive Optical
7710MD-HS	HD monitoring down converter - 1.5 Gb/s input 2 HD reclocked outputs, 2 SDI outputs	7710MD
7710MD- HN	HD monitoring down converter - 1.5 Gb/s input 2 HD reclocked outputs, 2 Analog outputs	7710MD
7710MD- HSN	HD monitoring down converter – 1.5 Gb/s input 4 HD reclocked outputs, 2 SDI , 2 Analog outputs	7710MD
7710MD- SN	HD monitoring down converter - 1.5 Gb/s input 2 SDI , 2 Analog outputs	7710MD
7710MD- S	HD monitoring down converter - 1.5 Gb/s input 4 SDI outputs	7710MD
7720AD-HD	HD AES Audio De-embedder - 2 AES Outputs	7720AD-HD
7720AD4-HD	HD AES Audio De-embedder - 4 AES Outputs	7720AD-HD
7720AE-HD	HD AES Audio Embedder - 2 AES Inputs	7720AE-HD
7730DAC-HD	HD D to A Converter: YPrPb/RGB & Sync – BNC Outputs	7730DAC-HD
7730DAC-HD-V	HD D to A Converter: VGA Output & GPI - DB15	7730DAC-HD
7732PFT-HD	HD Progressive Format Translator 1080p/24sF Input, 1080i/60 output	7732PFT-HD
7745FS-HD	HD Frame Synchronizer	7745FS-HD
7750TG-HD	HD Test Generator with Embedded Audio - 4 outputs	7750TG-HD
7750SRG-HD	HD Slave Reference Generator - 4 Sync outputs	7750SRG-HD

1.2. STANDARD DEFINITION TELEVISION PRODUCTS

Model	Description	Chapter
7700DA	SDI 4 output DA, reclocks 19.4, 143, 177, 270, 360 & 540Mb/s	7700DA
7700DA10	SDI 10 output DA, reclocks 19.4, 143, 177, 270, 360 & 540Mb/s	7700DA10
7700DA10-N	SDI 10 output DA, non-reclocking 19 to 540Mb/s	7700DA10
7705OE	Fiber to electrical converter - 1310 to 1550 nm MPEG TX rates up to 540Mbit/s	7705OE
7705EO13	Electrical to fiber converter - 1310 nm - distances to 50 Km MPEG TX rates up to 540Mbit/s	7705EO
7705EO15	Electrical to fiber converter - 1550 nm - distances to 50 Km MPEG TX rates up to 540Mbit/s	7705EO
7705CWDM	Fiber Optic coarse wavelength division multiplexor/demultiplexor – Allows use of single fiber for transmission of four signals at different wavelengths	Future
7705DS	Fiber Optic Distribution Splitter – Splits signal to two signals of 50% power	Passive Optical
7705MS	Fiber Optic Monitoring Splitter – Splits signal to two signals of 80%/20% power	Passive Optical
7705WDM	Fiber Optic wavelength division multiplexor/demultiplexor – Allows use of single fiber for transmission of two signals at different wavelengths	Passive Optical
7720AD	SDI AES Audio De-embedder - 2 AES Outputs	7720AD
7720AD4	SDI AES Audio De-embedder - 4 AES Outputs	7720AD
7720AE	SDI AES audio embedder - 2 AES Inputs	7720AE
7721DD	SDI Data De-embedder	7721DD
7721DE	SDI Data embedder	7721DE
7745FS	SDI Frame Synchronizer	7745FS (Future)
7750TG	SDI Test Generator with Embedded Audio - 4 outputs	7750TG
7760AVM-A	SDI Video and Audio Monitor – SDI input with embedded audio, 1 reclocked SDI output, 1 composite analog output with Audio level bargraphs and Source ID / VTR status keyed over video, 2 stereo pairs analog audio outputs	7760AVM
7760AVM-B	SDI Video and Audio Monitor – SDI input with embedded audio, 1 reclocked SDI output, 1 SDI output with Audio level bargraphs and Source ID / VTR status keyed over video, 2 stereo pairs analog audio outputs	7760AVM
7760AVM-C	SDI Video and Audio Monitor – SDI input with embedded audio, 1 reclocked SDI output, 1 composite analog output with Audio level bargraphs and Source ID / VTR status keyed over video, 2 stereo pairs AES audio outputs	7760AVM
7760AVM-D	SDI Video and Audio Monitor – SDI input, 1 AES channel input, 1 reclocked SDI output, 1 SDI output with Audio level bargraphs and Source ID / VTR status keyed over video, 2 stereo pairs analog audio outputs	7760AVM
7760AVM-E	SDI Video and Audio Monitor – SDI input with embedded audio, 2 reclocked SDI outputs, 2 composite analog and 2 SDI outputs with Audio level bargraphs and Source ID / VTR status keyed over video, 2 stereo pairs analog audio outputs	7760AVM
7760AVM-F	SDI Video and Audio Monitor – SDI input with embedded audio, 2 reclocked SDI outputs, 2 composite analog and 2 SDI outputs with Audio level bargraphs and Source ID / VTR status keyed over video, 2 stereo pairs analog and AES audio outputs	7760AVM

Model	Description	Chapter
7760AVM-G	SDI Video and Audio Monitor – SDI input with embedded audio, 1 composite analog and 1 SDI output with Audio level bargraphs and	7760AVM

	Source ID / VTR status keyed over video, 2 stereo pairs analog and AES audio outputs	
7760AVM-Lite	SDI Video and Audio Monitoring D to A Converter – SDI input with embedded audio, 1 reclocked SDI output, 1 composite analog output, 2 stereo pairs AES audio outputs	7760AVM-Lite

1.3. ANALOG TELEVISION PRODUCTS

Model	Description	Chapter
7700ADA	Analog equalizing DA, for HD component, and composite, AES	7700ADA
7700SID-CM	Composite analog Source ID decoder	7700SID-CM

2. MODULES BY FUNCTION

The modules listed in this section are organized by function then sub-sorted by video standard

2.1. DISTRIBUTION PRODUCTS

Model	Description	Chapter
7700DA	SDI 4 output DA, reclocks 19.4, 143, 177, 270, 360 & 540Mb/s	7700DA
7700DA10	SDI 10 output DA, reclocks 19.4, 143, 177, 270, 360 & 540Mb/s	7700DA10
7700DA10-N	SDI 10 output DA, non-reclocking 19 to 540Mb/s	7700DA10
7700DA-HD	1.5Gb/s 4 output HD DA (non reclocking for 19.4-540Mb/s)	7700DA-HD
7700DA8-HD	1.5Gb/s 8 output HD DA (non reclocking for 19.4-540Mb/s)	7700DA-HD
7700ADA	Analog equalizing DA, for HD component, and composite, AES	7700ADA
7745FS	SDI Frame Synchronizer	7745FS (Future)
7745FS-HD	HD Frame Synchronizer	7745FS-HD

2.2. FIBER OPTIC PRODUCTS

Model	Description	Chapter
7705OE	Fiber to electrical converter – 1310 to 1550 nm MPEG TX rates up to 540Mbit/s	7705OE
7705EO13	Electrical to fiber converter – 1310 nm – distances to 50 Km MPEG TX rates up to 540Mbit/s	7705EO
7705EO15	Electrical to fiber converter – 1550 nm – distances to 50 Km MPEG TX rates up to 540Mbit/s	7705EO
7705OE-HD	Fiber to electrical converter – 1310 to 1550 nm MPEG TX rates up to 1.5 Gb/s	7705OE-HD
7705OE-HD-L	Fiber to electrical converter – 1310 to 1550 nm MPEG TX rates up to 1.5 Gb/s – high sensitivity	7705OE-HD
7705EO13-HD	Electrical to fiber converter – 1310 nm – distances to 6 Km MPEG TX rates up to 1.5 Gb/s	7705EO-HD
7705EO13-HD-L	Electrical to fiber converter – 1310 nm MPEG TX rates up to 1.5 Gb/s – extra long haul	7705EO-HD
7705EO15-HD-L	Electrical to fiber converter – 1550 nm MPEG TX rates up to 1.5 Gb/s - extra long haul	7705EO-HD

Model	Description	Chapter
7705CWDM	Fiber Optic coarse wavelength division multiplexor/demultiplexor – Allows use of single fiber for transmission of four signals at different wavelengths	Future

7705DS	Fiber Optic Distribution Splitter – Splits signal to two signals of 50% power	Passive Optical
7705MS	Fiber Optic Monitoring Splitter – Splits signal to two signals of 80%/20% power	Passive Optical
7705WDM	Fiber Optic wavelength division multiplexor/demultiplexor – Allows use of single fiber for transmission of two signals at different wavelengths	Passive Optical

2.3. HD DOWN CONVERSION PRODUCTS

Model	Description	Chapter
7710MD-HS	HD monitoring down converter - 1.5 Gb/s input 2 HD reclocked outputs, 2 SDI outputs	7710MD
7710MD- HN	HD monitoring down converter – 1.5 Gb/s input 2 HD reclocked outputs, 2 Analog outputs	7710MD
7710MD- HSN	HD monitoring down converter – 1.5 Gb/s input 4 HD reclocked outputs, 2 SDI , 2 Analog outputs	7710MD
7710MD- SN	HD monitoring down converter - 1.5 Gb/s input 2 SDI , 2 Analog outputs	7710MD
7710MD- S	HD monitoring down converter - 1.5 Gb/s input 4 SDI outputs	7710MD

2.4. SOURCE ID / VIDEO AND AUDIO MONITORING & CONVERSION PRODUCTS

7700SID-CM	Composite analog Source ID decoder	7700SID-CM
7760AVM-A	SDI Video and Audio Monitor – SDI input with embedded audio, 1 reclocked SDI output, 1 composite analog output with Audio level bargraphs and Source ID / VTR status keyed over video, 2 stereo pairs analog audio outputs	7760AVM
7760AVM-B	SDI Video and Audio Monitor – SDI input with embedded audio, 1 reclocked SDI output, 1 SDI output with Audio level bargraphs and Source ID / VTR status keyed over video, 2 stereo pairs analog audio outputs	7760AVM
7760AVM-C	SDI Video and Audio Monitor – SDI input with embedded audio, 1 reclocked SDI output, 1 composite analog output with Audio level bargraphs and Source ID / VTR status keyed over video, 2 stereo pairs AES audio outputs	7760AVM
7760AVM-D	SDI Video and Audio Monitor – SDI input, 1 AES channel input, 1 reclocked SDI output, 1 SDI output with Audio level bargraphs and Source ID / VTR status keyed over video, 2 stereo pairs analog audio outputs	7760AVM
7760AVM-E	SDI Video and Audio Monitor – SDI input with embedded audio, 2 reclocked SDI outputs, 2 composite analog and 2 SDI outputs with Audio level bargraphs and Source ID / VTR status keyed over video, 2 stereo pairs analog audio outputs	7760AVM
7760AVM-F	SDI Video and Audio Monitor – SDI input with embedded audio, 2 reclocked SDI outputs, 2 composite analog and 2 SDI outputs with Audio level bargraphs and Source ID / VTR status keyed over video, 2 stereo pairs analog and AES audio outputs	7760AVM

Model	Description	Chapter
7760AVM-G	SDI Video and Audio Monitor – SDI input with embedded audio, 1 composite analog and 1 SDI output with Audio level bargraphs and Source ID / VTR status keyed over video, 2 stereo pairs analog and AES audio outputs	7760AVM
7760AVM-Lite	SDI Video and Audio Monitoring D to A Converter – SDI input with	7760AVM-Lite

	embedded audio, 1 reclocked SDI output, 1 composite analog output, 2 stereo pairs AES audio outputs	

2.5. AUDIO /DATA EMBEDDER/DEEMBEDDER PRODUCTS

Model	Description	Chapter
7720AD	SDI AES Audio De-embedder - 2 AES Outputs	7720AD
7720AD4	SDI AES Audio De-embedder – 4 AES Outputs	7720AD
7720AD-HD	HD AES Audio De-embedder - 2 AES Outputs	7720AD-HD
7720AD4-HD	HD AES Audio De-embedder - 4 AES Outputs	7720AD-HD
7720AE	SDI AES audio embedder - 2 AES Inputs	7720AE
7720AE-HD	HD AES Audio Embedder - 2 AES Inputs	7720AE-HD
7721DD	SDI Data De-embedder	7721DD
7721DE	SDI Data embedder	7721DE

2.6. CONVERSION PRODUCTS

Model	Description	Chapter
7730DAC-HD	HD D to A Converter: YPrPb/RGB & Sync – BNC Outputs	7730DAC-HD
7730DAC-HD-V	HD D to A Converter: VGA Output & GPI - DB15	7730DAC-HD
7732PFT-HD	HD Progressive Format Translator 1080p/24sF Input, 1080i/60 output	7732PFT-HD

2.7. TEST GENERATOR PRODUCTS

Model	Description	Chapter
7750TG	SDI Test Generator with Embedded Audio - 4 outputs	7750TG
7750TG-HD	HD Test Generator with Embedded Audio - 4 outputs	7750TG-HD
7750SRG-HD	HD Slave Reference Generator - 4 Sync outputs	7750SRG-HD

2.8. CONTROL PRODUCTS

Model	Description	Chapter
7700FC	7700 Frame Controller – Ethernet or RS 232/422 control for the 7700 frame	7700FC

3. MODULES BY MODEL NUMBER

The modules listed in this section are organized by model number

Model	Description	Chapter
7700ADA	Analog equalizing DA, for HD component, and composite, AES	7700ADA
7700DA	SDI 4 output DA, reclocks 19.4, 143, 177, 270, 360 & 540Mb/s	7700DA
7700DA10	SDI 10 output DA, reclocks 19.4, 143, 177, 270, 360 & 540Mb/s	7700DA10
7700DA10-N	SDI 10 output DA, non-reclocking 19 to 540Mb/s	7700DA10
7700DA-HD	1.5Gb/s 4 output HD DA (non reclocking for 19.4-540Mb/s)	7700DA-HD
7700DA8-HD	1.5Gb/s 8 output HD DA (non reclocking for 19.4-540Mb/s)	7700DA-HD
7700FC	7700 Frame Controller – Ethernet or RS 232/422 control for the 7700 frame	7700FC
7700SID-CM	Composite analog Source ID decoder	7700SID-CM
7705CWDM	Fiber Optic coarse wavelength division multiplexor/demultiplexor – Allows use of single fiber for transmission of four signals at different wavelengths	Future
7705DS	Fiber Optic Distribution Splitter – Splits signal to two signals of 50% power	Passive Optical
7705EO13	Electrical to fiber converter - 1310 nm – distances to 50 Km MPEG TX rates up to 540Mbit/s	7705EO
7705EO13-HD	Electrical to fiber converter - 1310 nm – distances to 6 Km MPEG TX rates up to 1.5 Gb/s	7705EO-HD
7705EO13-HD-L	Electrical to fiber converter - 1310 nm MPEG TX rates up to 1.5 Gb/s - extra long haul	7705EO-HD
7705EO15	Electrical to fiber converter - 1550 nm – distances to 50 Km MPEG TX rates up to 540Mbit/s	7705EO
7705EO15-HD-L	Electrical to fiber converter - 1550 nm MPEG TX rates up to 1.5 Gb/s - extra long haul	7705EO-HD
7705MS	Fiber Optic Monitoring Splitter – Splits signal to two signals of 80%/20% power	Passive Optical
7705OE	Fiber to electrical converter - 1310 to 1550 nm MPEG TX rates up to 540Mbit/s	7705OE
7705OE-HD	Fiber to electrical converter - 1310 to 1550 nm MPEG TX rates up to 1.5 Gb/s	7705OE-HD
7705OE-HD-L	Fiber to electrical converter - 1310 to 1550 nm MPEG TX rates up to 1.5 Gb/s – high sensitivity	7705OE-HD
7705WDM	Fiber Optic wavelength division multiplexor/demultiplexor – Allows use of single fiber for transmission of two signals at different wavelengths	Passive Optical
7710MD- HN	HD monitoring down converter - 1.5 Gb/s input 2 HD reclocked outputs, 2 Analog output	7710MD
7710MD- HSN	HD monitoring down converter – 1.5 Gb/s input 4 HD reclocked outputs, 2 SDI , 2 Analog outputs	7710MD
7710MD- S	HD monitoring down converter – 1.5 Gb/s input 4 SDI outputs	7710MD
7710MD- SN	HD monitoring down converter – 1.5 Gb/s input 2 SDI , 2 Analog outputs	7710MD
7710MD-HS	HD monitoring down converter - 1.5 Gb/s input 2 HD reclocked outputs, 2 SDI outputs	7710MD
7720AD	SDI AES Audio De-embedder - 2 AES Outputs	7720AD
7720AD4	SDI AES Audio De-embedder - 4 AES Outputs	7720AD
7720AD-HD	HD AES Audio De-embedder - 2 AES Outputs	7720AD-HD
7720AD4-HD	HD AES Audio De-embedder - 4 AES Outputs	7720AD-HD

Model	Description	Chapter
7720AE	SDI AES audio embedder - 2 AES Inputs	7720AE
7720AE-HD	HD AES Audio Embedder - 2 AES Inputs	7720AE-HD
7721DD	SDI Data De-embedder	7721DD
7721DE	SDI Data embedder	7721DE
7730DAC-HD	HD D to A Converter: YPrPb/RGB & Sync – BNC Outputs	7730DAC-HD
7730DAC-HD-V	HD D to A Converter: VGA Output & GPI - DB15	7730DAC-HD
7732PFT-HD	HD Progressive Format Translator 1080p/24sF Input, 1080i/60 output	7732PFT-HD
7745FS	SDI Frame Synchronizer	7745FS (Future)
7745FS-HD	HD Frame Synchronizer	7745FS-HD
7750TG	SDI Test Generator with Embedded Audio - 4 outputs	7750TG
7750TG-HD	HD Test Generator with Embedded Audio - 4 outputs	7750TG-HD
7750SRG-HD	HD Slave Reference Generator - 4 Sync outputs	7750SRG-HD
7760AVM-A	SDI Video and Audio Monitor – SDI input with embedded audio, 1 reclocked SDI output, 1 composite analog output with Audio level bargraphs and Source ID / VTR status keyed over video, 2 stereo pairs analog audio outputs	7760AVM
7760AVM-B	SDI Video and Audio Monitor – SDI input with embedded audio, 1 reclocked SDI output, 1 SDI output with Audio level bargraphs and Source ID / VTR status keyed over video, 2 stereo pairs analog audio outputs	7760AVM
7760AVM-C	SDI Video and Audio Monitor – SDI input with embedded audio, 1 reclocked SDI output, 1 composite analog output with Audio level bargraphs and Source ID / VTR status keyed over video, 2 stereo pairs AES audio outputs	7760AVM
7760AVM-D	SDI Video and Audio Monitor – SDI input with embedded audio, 1 AES channel input, 1 reclocked SDI output, 1 SDI output with Audio level bargraphs and Source ID / VTR status keyed over video, 2 stereo pairs analog audio outputs	7760AVM
7760AVM-E	SDI Video and Audio Monitor – SDI input with embedded audio, 2 reclocked SDI outputs, 2 composite analog and 2 SDI outputs with Audio level bargraphs and Source ID / VTR status keyed over video, 2 stereo pairs analog audio outputs	7760AVM
7760AVM-F	SDI Video and Audio Monitor – SDI input with embedded audio, 2 reclocked SDI outputs, 2 composite analog and 2 SDI outputs with Audio level bargraphs and Source ID / VTR status keyed over video, 2 stereo pairs analog and AES audio outputs	7760AVM
7760AVM-G	SDI Video and Audio Monitor – SDI input with embedded audio, 1 composite analog and 1 SDI output with Audio level bargraphs and Source ID / VTR status keyed over video, 2 stereo pairs analog and AES audio outputs	7760AVM
7760AVM-Lite	SDI Video and Audio Monitoring D to A Converter – SDI input with embedded audio, 1 reclocked SDI output, 1 composite analog output, 2 stereo pairs AES audio outputs	7760AVM-Lite

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Figures

REVISION HISTORY

REVISION	**DESCRIPTION**	**DATE**
1.0	Original Version	Sep 00

1. OVERVIEW

The 7701FR is a 1 rack unit high rack frame for the 7700 series modular system. This advanced rack frame design can house up to 3 modules of any combination of the 7700 series distribution, conversion, processing and synchronization modules. Special care was taken during the design process to ensure that the 7701FR meets the demanding needs of television studios today has sufficient flexibility to satisfy the emerging demands of the future.

The 7701FR is designed with a high density capacity to conserve on precious equipment rack space. Care has been taken to ensure sufficient thermal relief for up to 60 watts of processing power per frame, to meet the increasing power demands of future high speed processing cards.

The front loading design permits extraction of the active modules from the front without compromising performance even at 1.5Gb/s. Thus, there is no need for time consuming re-cabling nor is there need to have access to the rear of the frame replace or exchange modules.

Features:
- Houses up to 3 processing modules
- Each slot has individually configurable inputs and outputs
- Front monitoring window for verifying module and power supply status
- Frame status contact closure alarm signals power supply or fan failures and user selectable module alarms
- Front extractable modules
- Auto-ranging power supply operates from 90-250vac at 60/50hz

1.1. SPECIFICATIONS

1.1.1. Electrical

AC Mains Input	Auto ranging, 100 ⇔ 240 VAC, 50/60 Hz
Fuses:	2 amp, 250 Volt time delay 5 x 20 mm. – line and neutral
Maximum Power Dissipation:	60 W
Certification: Safety:	ETL Listed, Complies with CE Safety Directive
EMC:	Complies with FCC part 15, class A.
	Complies with EU EMC directive
Status Indicators:	PSU status LED
	Frame Fault LED
Tally Output Connector:	4 pin terminal, relay N/O, N/C for status/fault alarm
Temperature:	0 - 40°C optimal performance
	0 - 50°C operating

1.1.2. Physical

Height:	1.75" (45 mm)
Width:	19" (483 mm)
Depth:	14.5" (368 mm)
Module Capacity:	3 single or double slot modules
Weight:	Approx 7 lbs (3.1 Kg) with no cards
	Approx. 10 lbs. (4.5 Kg) with 3 slots occupied

1.2.   COOLING

The 7701FR frame is designed to ensure adequate cooling for up to 60 watts of processing power per frame. Fans at the front and rear of the power supply module accomplish forced air cooling. Adjacent equipment may be mounted immediately to the top and bottom of the 7701FR frame. Additional module cooling is provided by interior cooling channels to ensure that even fully loaded frames mounted adjacent to each other will operate within the normal temperature range.

1.2.1. Fan Exhaust

The cooling fans for the power supply, located at the front of the frame, draws air in the front and exhaust out the side of the frame. The cooling fan for the modules, located at the rear of the frame, and draws air in the front and the exhaust out the rear of the frame. To ensure adequate cooling, care should be taken to ensure that the fan inlets and exhaust openings are free of obstructions.

1.3.   MOUNTING

The 7701FR Rack frame requires 1 rack units i.e. 1.75 inches (45 mm) of standard.19 inch (483 mm) wide rack space. To securely fasten the frame to the equipment rack, make sure that all four mounting screws are tightened securely.

1.4.   POWER

The 7701FR frame comes with an auto-ranging power supply that automatically senses the input voltage. Power should be applied by connecting a 3-wire grounding type power supply cord to the power entry module on the rear panel.   The power cord should be minimum 18 AWG wire size; type SST marked VW-1, maximum 2.5 m in length.

The power entry module contains a standard IEC power inlet connector, two 5 x 20 mm fuse holders and an EMI line filter.

1.4.1. Changing the Fuses

The fuse holder is located inside the power entry module. To change the fuses, pull out the fuse holder from the power entry module using a small screwdriver. The fuse holder contains two fuses, one for the line and one for the neutral side of the mains connection. Pull out the blown fuse and place a fuse of the correct value in its place. Use slo blo (time delay) 5 x 20 mm fuses rated for 250 Volts with a current rating of 2 amp. For your convenience there are spare fuses located in the vinyl pouch in the front of this manual. Carefully reinsert the fuseholder into the power entry module.

> **Check that the line fuse is rated for the correct value marked on the rear panel. Never replace with a fuse of greater value.**

1.4.2. Turning the Power On and Off

The 7701PS power supply is fitted with a power switch on the front. This switch is accessible by lowering the front panel of the frame.

1.4.3. Power Supply Indicators

The power supply has two indicators. The Red Frame Fault LED indicates the health of the entire frame. It will be On when one of the modules or the power supply is indicating a local fault on the frame status bus. The green PSU STATUS LED indicates the health of the local power supply.

For example, if the power supply malfunctions, then its PSU Status LED will go off, and the frame Fault LED will turn on. The Frame fault will also be indicated on the Frame Status terminal block on the rear panel.

If there is a fuse failure return the power supply immediately. The power supplies are short circuit protected and should not blow the fuse under a short circuit condition.

1.4.4. Replacing the Power Supply

The power supply is a complete assembly and includes the power supply cooling fan and one frame cooling fan. In the event that the power supply or one of the fans malfunctions, you will need to replace the power supply assembly with a spare one while the failed assembly is being repaired.

The 7701FR power supply can be easily replaced from the front. The power supply is secured into the frame by a thumb screw on the front of the power supply (as shown in

Power Supply
Hold down Screw
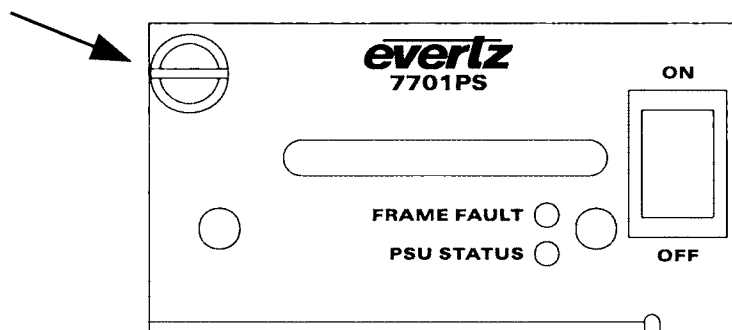
Figure 1). This screw must be loosened before the power supply can be extracted. It is recommended that you tighten the mounting screw after replacing the power supply.

Power Supply
Hold down Screw
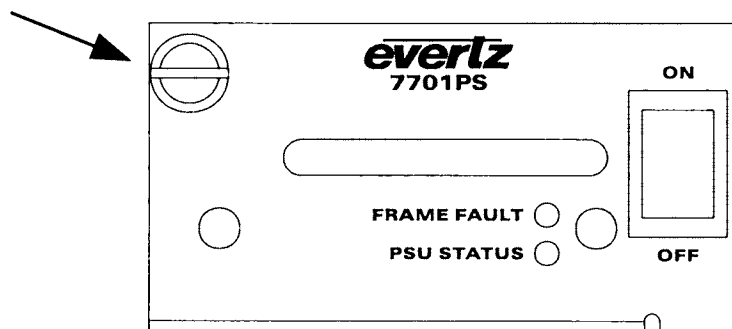
Figure 1: Locating the Power Supply Mounting Screw

To replace the power supply the following procedure should be used.

1. Turn off the power supply switch
3. Open the front door of the frame
2. Loosen the power supply hold down screw.
4. Pull the power supply out of the frame.
5. Reinsert the new power supply into the frame taking care that it is proper aligned with the card guides. Press firmly to make sure that the power supply is fully seated into the rear panel connector.
6. Tighten the power supply hold down screw.
7. Turn on the power switch for the power supply. After a few seconds you should see the PSU STATUS LED come on indicating that the power supply is working correctly.

2.   STATUS INDICATOR TERMINAL BLOCK

There is a terminal block at the rear of the frame that can be wired for frame status/fault indication. There are 4 connections:

Label	Pin #	Function
G	1	Chassis Ground
R	2	Common (connect to Ground or your reference)
O	3	Open with respect to common on a fault
C	4	Closed with respect to common on a fault

Table 1: Status Tally Terminal Block Pin Assignments

3.   INSTALLING AND REMOVING THE MODULES

3.1.   INSTALLING THE MODULE REAR PLATES

Each module is shipped with a matching rear panel plate which houses the connectors appropriate for the module. When installing a rear plate, locate the desired slot position where you wish to install the rear plate. Make a note of the slot number where you are installing the rear plate. Orient the plate so that the labeling is visible when the plate is installed. Loosely fasten the plate to the extrusions using the mounting screws provided, beginning with the top screw. You will tighten the screws after the main module is installed.

3.2.   OPENING AND CLOSING THE FRONT PANEL

In order to insert or remove modules you will have to open the front panel. Turn the two captive screws located on the front panel counter clockwise several turns until they release completely from the front extrusions. Carefully lower the front panel door so that the front edge of the door is lower than the rear of the door.

3.3.   INSTALLING THE MODULES

Orient the module horizontally such that the white card ejector is on the right. Align the card with the card guide corresponding to the slot number where you installed the rear panel plate. Carefully slide the module into the frame and press it completely into the rear panel connectors. Make sure that the connectors are fully seated in the rear panel. When this is done, close the front panel and then tighten the screws that hold the rear panel in place.

3.4.   REMOVING THE MODULES

Press the card ejector to release the module. Grasp then the card using the card ejector and pull the module out from the frame. Carefully place the module in a safe place, free from static discharge.

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TABLE OF CONTENTS

Figures

Tables

REVISION HISTORY

<u>REVISION</u>	<u>DESCRIPTION</u>	<u>DATE</u>
1.0	Original Version	June 99
1.1	Sections on design parameters, and design examples added	Aug 99
1.2	Changed Insertion Loss parameter on 7705MS to 9 dB	Jan 00
1.3	Changed Input power, and sensitivity values in Table 2 Changed part number of 7705EO15-HD-I to conform to new naming convention	July 00

1. FIBER OPTICS FUNDAMENTALS

Fiber optics is best known for its applications in the telephone industry, even though it is widely used in video and television systems. In television systems they typically send signals between two locations or distribute the same signal to many destinations.

Traditional video distribution systems have used coaxial copper cabling. Fiber optic cable provides many advantages over traditional copper wire:

- Lower cable losses allow longer distances without distribution amplifiers
- Ability to carry higher data rate signals
- Improved signal quality
- Immunity from electro-magnetic radiation and Lightning
- Light Weight

The crucial difference between fiber optic distribution systems and coaxial cable systems is that signals are transmitted as light. The two key elements of optical fiber are its core and its cladding. The core is the inner part of the fiber, through which the light is guided. The cladding surrounds the core completely. The refractive property of the cladding is higher than that of the core, so light in the core that strikes the boundary with the cladding at a glancing angle, is totally reflected back into the core. The boundary of the core and cladding acts like a "cylindrical mirror", causing the core to act as a light pipe.
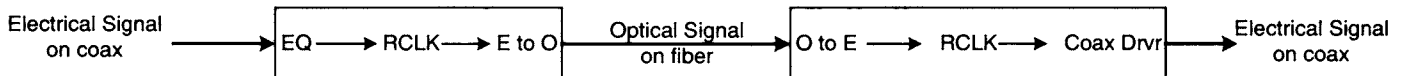
Figure 1: Components of a Fiber Optic Transmission System

The role of an optical transmitter is to convert an electrical data signal into an equivalent optical power waveform and couple it into an optical fiber. The role of the optical fiber is to convey the light from the source to the destination with the minimal amount of signal loss. The role of the optical receiver is to convert the optical power waveform back into an equivalent electrical data signal.

1.1. SYSTEM DESIGN PARAMETERS

1.1.1. Electrical to Optical Parameters

In optical output devices, the main design parameters that are important are the launched output power, the wavelength and the linewidth. Launch power and wavelength are always important in system designs. Line width is usually important only in high definition applications.

1.1.1.1. Transmitter Output Launch Power

The launched output power tells up the maximum power available at the optical transmitter. The following table indicates the launched output power available on current Evertz EO modules.

Module	Minimum Launch Power	Central Wavelength	Spectral width of Optical Signal
7705EO13	-7.5 dBm	1310 nm	5 nm
7705EO13-HD	-7.5 dBm	1310 nm	5 nm
7705EO13-HD-L	0 dBm	1310 nm	0.8 nm
7705EO15	0 dBm	1550 nm	0.8 nm
7705EO15-HD-L	0 dBm	1550 nm	0.8 nm

Table 1: Launch Power

1.1.1.2. Wavelength

The wavelength of the optical signal determines the cable loss window within which the system will operate.

The Loss versus wavelength graph in Figure 2 shows that at 1310nm the cable loss is 0.40dB/km and at 1550nm the loss is 0.30dB/km.
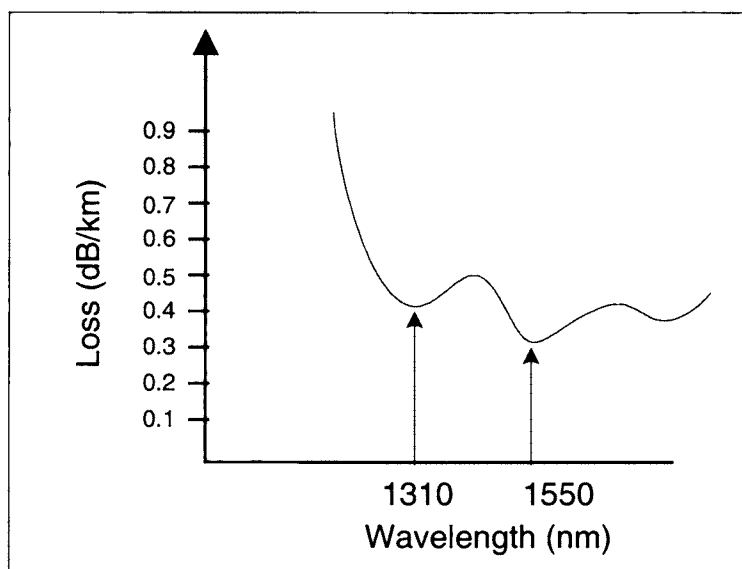
Figure 2: Cables Losses at Various Wavelengths

1.1.1.3. Linewidth

The linewidth is a measure of the laser's spectral purity, and determines the jitter penalty (how much jitter gets added to the signal). Linewidth is important in HD applications because the additional jitter penalty is significant compared to the bit period. In standard definition video applications linewidth is usually not a problem because the signal will lose too much power before it can go far enough for jitter to be a problem.

At 1310nm the jitter penalty is approximately 2.5psec/km of fiber /nm of linewidth. At 1550nm the jitter penalty is approximately 17ps/km of fiber/nm of linewidth.
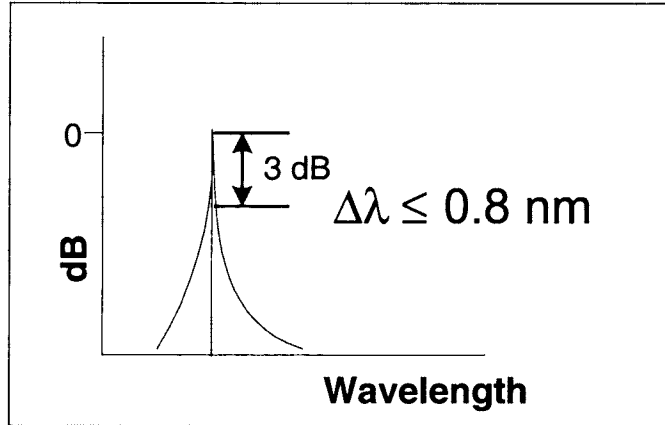
Figure 3: Spectrum of Laser used in EO13-HD-L and EO15-HD-L
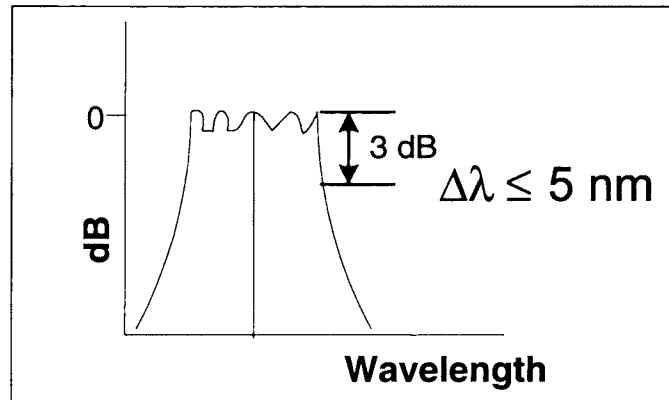
Figure 4: Spectrum of Laser used in EO13 and EO13-HD

1.1.2. Optical to Electrical Parameters

In Optical input devices, the main design parameters that are important are the maximum power before overload and the minimum power before errors (Sensitivity). The following table indicates the maximum power and sensitivity on current Evertz OE modules.

Module	Maximum Input Power	Sensitivity
7705OE	0 dBm	-29 dBm
7705OE-HD	-3 dBm	-15 dBm
7705OE-HD-L	-3 dBm	-22 dBm

Table 2: Optical Receiver Power Parameters

1.1.3. Passive Optical Module Parameters

In passive optical modules, the main design parameter that is important is the loss through the passive device. The following table indicates the power loss on current Evertz passive fiber modules.

Module	Port	Insertion Loss
7705WDM	1310 nm	2 dB
	1550 nm	2 dB
7705DS	50 %	4 dB
	50 %	4 dB
7705MS	80 %	2 dB
	20 %	9 dB

Table 3: Passive Module Insertion Loss

1.2. DESIGN EXAMPLES

1.2.1. Standard Definition 2 km Link
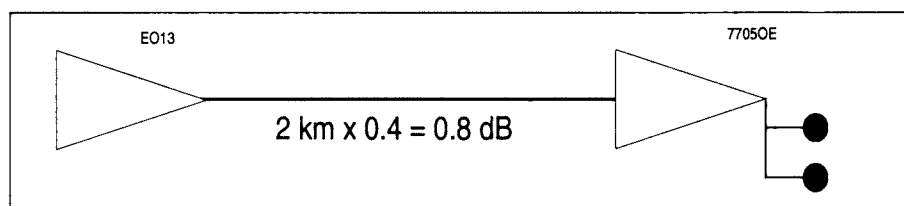
Using the 7705EO13 as the transmitter.

Launch Power =		-7.5 dBm
Connector Loss = 2 x 1		-2.0 dB
Fiber Loss = 2 x 0.4		-0.8 dB
Safety Margin =		-2.0 dB
Power at receiver		−12.3 dBm

The 7705OE has a listed sensitivity of −29 dBm which is lower than −12.3 dBm so we can implement the system with no problems, at least with respect to power availability.

Next we need to check the jitter penalty. The system jitter-penalty = 2.5 ps/ x 2 km x 5 nm = 25 ps. So by going through 2km of fiber, we add 25ps of jitter under the worst conditions (under the best conditions we would add 2ps total). The standard definition video bit period is 3.7 ns; so if the maximum jitter penalty is 20% or 740 ps., then the added jitter for this system is insignificant.

When would jitter-penalty be a problem? For 1310 nm wavelengths, the cable length where the jitter penalty becomes significant is calculated as: 740 ps divided by 2.5 ps/km/nm divided by 5 nm = 60 Km (worst case), or 600 Km (normal condition) At 60 Km cable length the cable loss is 60 x 0.4 = 24 dB. So the power into the receiver would be: − 6 dBm − 24 dB = − 30 dBm. This is below the published specification of -28.5 dBm. The jitter penalty at 1550 nm for standard definition video is calculated as: 740 divided by 17 divided by 0.8 = 54 Km (worst case). At 54 Km cable length the cable loss is 54 x 0.3 = 16.2 dB. So the power into the receiver would be: - 0 dBm − 16.2 dB = - 16.2 dBm. This is above the published specification of -28.5 dBm, so added jitter may become significant on cable lengths approaching 54 Km at 1550 nm.

1.2.2. 20 Km Link With 2 Standard Definition Signals On 1 Fiber
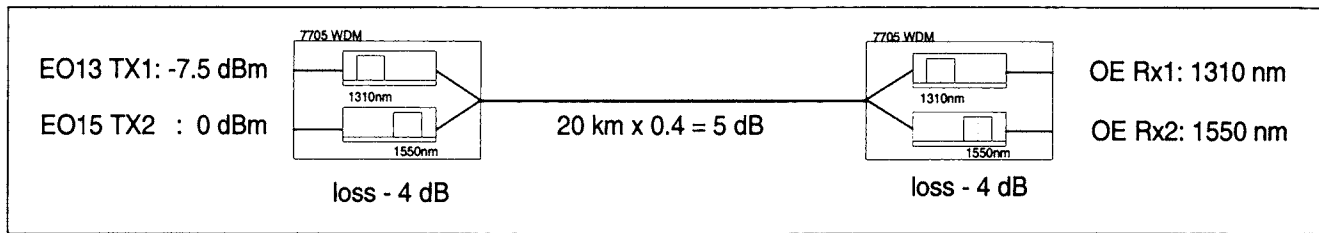
For Tx1 < Rx1:

Launch Power =	-7.5 dBm
Connector Loss = 4 x 1	-4.0 dB
Fiber Loss = 20 x 0.4	-8.0 dB
Safety Margin =	-2.0 dB
WDM Loss = 2 x 4	-8.0 dB
Power at receiver	−29.5 dBm

For the 1310 nm path the power available at the receiver is very close to the receiver input sensitivity of − 28.5 dBm. This calculation assumes the worst case connector losses, and a safety margin of 2 dB. In practice, the actual system may be viable, but we should assemble the system including the connectors and actually measure the available power at the receiver to determine the viability for sure. For the 1550 nm path the transmitter launch power is greater and the cable loss is less, so the resulting system design is OK for power loss.

2. CALCULATING THE OPTICAL SYSTEM POWER BUDGET

Given a specific optical transmitter and receiver pair, the most important question concerning a system designer or integrator is the maximum possible link length. Here is a worksheet that simplifies this calculation. The specific receiver/transmitter parameters used in the worksheet vary depending on the specific module being used. Consult the specifications in the respective chapters for the modules to get the correct values for the worksheet.

Transmitter Launch Power .... _____ dBm

Receiver Sensitivity .... - _____ dBm

Maximum Allowable Loss: .... = _____ dB

Fiber Loss: † _____km X Attenuation: _____dB/km .... _____ dB

Connector Loss: ‡ _____Connectors X Loss/Connector _____ dB...... + _____ dB

Passive Device Attenuation............ + _____ dB

Safety Margin .... + _____ dB

Total System Loss: .... = _____ dB

If the Total System Loss < Maximum Allowable loss, then the system is viable. A conservative industry standard for the safety margin is 2dB, and 1 dB per connector. However, these may vary and are usually determined by the system integrator/system engineer.

† Attenuation over Corning SMF 28 Single Mode Fiber: 0.3 dB/km @ 1550 nm, 0.4 dB/km @ 1310 nm

‡ If 62.5μm multimode fiber is used then 2dB must be added to the connector loss to account for receiver and cable fiber diameter mismatch.

3.   CARE AND HANDLING OF OPTICAL FIBER

3.1.   SAFETY

Never look directly into an optical fiber. Non-reversible damage to the eye can occur in a matter of milliseconds. The laser modules used in Evertz fiber optic products are all CLASS I, with a maximum output power of 2mW, and wavelengths of either 1310 nm or 1550 nm.

3.2.   HANDLING AND CONNECTING FIBERS

	Never touch the end face of an optical fiber.

The transmission characteristics of the fiber are dependent on the shape of the optical core and therefore care must be taken to prevent fiber damage due to heavy objects or abrupt fiber bending. Evertz recommends that you maintain a minimum bending radius of 3 cm to avoid fiber bending loss that will decrease the maximum attainable distance of the fiber cable. Evertz fiber modules come with cable lockout devices, to prevent the user from damaging the fiber by installing a module into a slot in the frame that does not have a suitable I/O module.

Dust particles on the ends of the optical fiber greatly increase the signal loss at interconnections, and large dust particles can even obscure light transmission altogether. To minimize the effects of dust contamination at the interconnections, the fiber should be cleaned each time it is mated or unmated. When using interconnection housings to mate two optical fibers it is good practice to remove dust particles from the housing assembly with a blast of dry air. Whenever a fiber is unmated it must be covered immediately. Most fiber manufacturers provide a plastic boot that fits over the ferrule body for this purpose.

Fiber interconnections must be made securely. The Evertz fiber optical transmitters and receivers come with SC interconnection housings built into the module. With this style of connector, the fiber assembly and the housing assembly can only be connected in one way and with very good repeatability. The rear fiber interconnect panel that is provided with each module can be ordered with optional Sc/PC. ST/PC or FC/PC connectors. The customer is required to provide the optical fiber with the correct connectors to connect the modules together. SC/PC, ST/PC and FC/PC interconnection housing and connectors as well as adapters are industry standards with many available sources.

3.3.   MAKING SURE THE OPTICAL FIBERS ARE CLEAN

It is very important to ensure that optical fibers are clean before mating and after unmating. You should have received a pre-moistened tissue with the optical module. Remove this tissue from its package and wipe the end of the fiber connector before mating it to the module.

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TABLE OF CONTENTS

REVISION HISTORY

REVISION	DESCRIPTION	DATE
1.0	Original Version	June 99
1.1	Updated list of available modules Added support for 7700PB2 and 7730DAC boards Revised cable drawing for WA-S76 cable Added procedure for upgrading standalone units	July 00

1. OVERVIEW

Some of the 7700 series modules contain firmware that is contained in a FLASH EPROM device. From time to time firmware updates will be provided to add additional features to the unit. The following procedure will allow you to upload new firmware from your computer.

1.1. UPDATING THE FIRMWARE IN MODULES BASED ON THE 7700PB, 7700PB2 and 7730DAC BOARDS

Many of the 7700 series modules are based on the 7700PB, 7700PB2 or 7730DAC processing boards. You will find the board number printed on the top front corner of the module base board. At the time of writing these modules are:

Model	Description	Board
7710MD	HD monitoring down converter	7700PB
7720AD	SDI AES Audio De-embedder	7700PB
7720AD-HD	HD AES Audio De-embedder	7700PB
7720AE	SDI AES Audio Embedder	7700PB
7720AE-HD	HD AES Audio Embedder	7700PB
7721DD	SDI Data De-embedder	7700PB
7721DE	SDI Data Embedder	7700PB
7730DAC-HD	HD D to A Converter	7730DAC
7732PFT-HD	HD Progressive Format Translator	7700PB2
7750SRG-HD	HS Slave Reference Generator	7730DAC
7750TG	SD Test Signal Generator	7700PB
7750TG-HD	HD Test Signal Generator	7700PB
7760AVM	SD Audio/Video Monitor	7700PB2
7760AVM-Lite	SD Monitoring D to A convertor	7700PB2

Table 1: 7700 Series Modules

The procedure for upgrading the firmware in each of these modules is the same. Through the rest of this section these modules will be referred to generically as the 7700PB module.

1.1.1. Requirements

You will need the following equipment in order to update the 7700PB Firmware
- PC with available communications port. The communication speed is 57600 baud, therefore a 486 PC or better with a 16550 UART based communications port is recommended.
- "Straight-thru" serial extension cable (DB9 female to DB9 male) or (DB25 female to DB9 male)
- Terminal program that is capable of Xmodem file transfer protocol. (such as HyperTerminal)
- New firmware supplied by Evertz.
- Special upgrade cable supplied with the 7700FR frame. This cable is normally in the vinyl pouch at the front of this manual. There are two different types of cables, depending on whether you have a 7700PB Rev 1 (Evertz part # WA-S75) or 7700PB Rev A or later, 7700PB2 or 7730DAC board (Evertz part #WA S76).

1.1.2. Update Procedure 7700PB boards

1.1.2.1. Part 1 – Configuring the module for Firmware upgrades – 7700PB Rev 1 boards

1. Remove the module from the frame.

2. Connect the 7700PB Rev 1 Serial Upgrade cable to the 2 row x 5 pin header labelled J12 on the top edge of the 7700PB board as shown in Figure 1. The cable has a key installed so that it cannot be installed backwards.

7700 PB End			PC End	
2 row X 5 pin Berg	Pin	3 ft. Ribbon Cable	9 pin D Female	Pin
n/c	1			
Rx	2	--------------	Tx	2
Tx	3	--------------	Rx	3
n/c	4			
Tx Gnd	5	--------------	Gnd	5
n/c	6			
n/c	7			
n/c	8			
n/c	9			
Key	10			

Table 2: 7700PB Rev 1 Upgrade Cable (WA-S75)

3. Move the jumper, located on the end of the GPIO header to the UPGRADE position as shown in Figure 1.
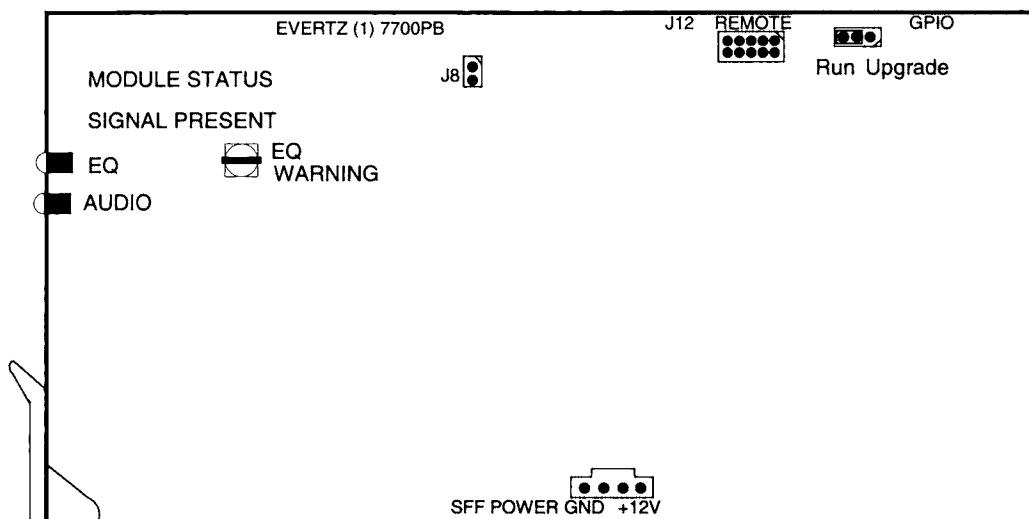
Figure 1 : Location of UPGRADE Jumper on Rev 1 7700PB Boards

4. Connect the 9 pin connector on the end of the Serial Update cable to the the PCs' RS-232 communications port.

5. Proceed to Part 2 – Terminal program setup.

1.1.2.2. Part 1 – Configuring the module for Firmware upgrades – 7700PB Rev A and later, 7700PB2 and 7730DAC boards

1. Remove the module from the frame.

2. Connect the 7700PB Serial Upgrade cable to the 2 row x 3 pin header labelled J24 on the front edge of the 7700PB board as shown in Figure 2. Install the cable with the ribbon cable towards the front of the board.

7700 PB End			PC End	
2 row X 3 pin Berg	Pin	3 ft. Cable (9501)	9 pin D Female	Pin
Key	1			1
Rx	2	-------1a------	Tx	2
Tx	3	-------1b------	Rx	3
Tx Gnd	4	----drain-----	Gnd	5
Key	5			
---	6			

Table 3: 7700PB Rev A and Later Upgrade Cable (WA-S76)
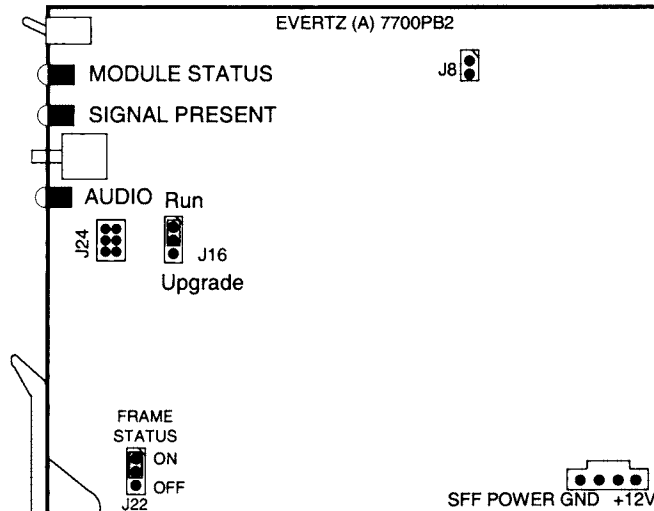
Figure 2 : Location of UPGRADE Jumper on Rev A and later 7700PB and 7700PB2 Boards
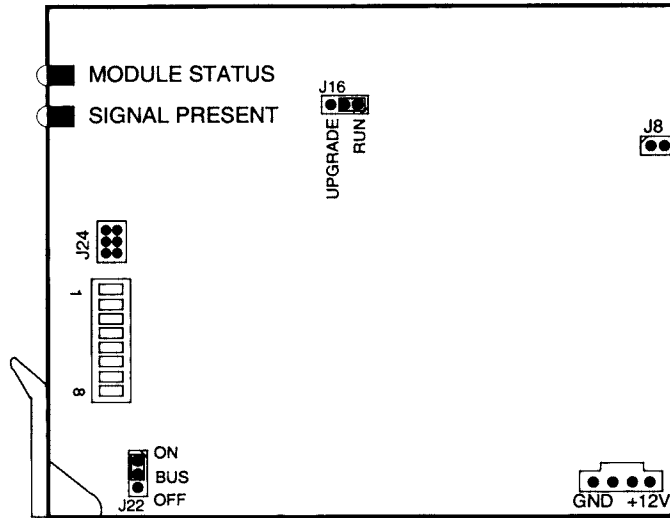
Figure 3 : Location of UPGRADE Jumper on 7730DAC Boards

3. Move jumper J16 to the UPGRADE position as shown in Figure 2.

4. Connect the 9 pin connector on the end of the Serial Update cable to the the PCs' RS-232 communications port

5. Proceed to Part 2 – Terminal program setup.

1.1.2.3. Part 2 – Terminal program Setup

6. Start the terminal program.

7. Configure the port settings of the terminal program as follows:

Baud	57600
Parity	no
Data bits	8
Stop bits	2
Flow Control	None

8. Install the 7700PB module into the frame. After the module powers up, a banner with the boot code version information should appear in the terminal window.

For example:

```
EVERTZ 7700PB MONITOR 1.0
COPYRIGHT 1997, 1998, 1999 EVERTZ MICROSYSTEMS LTD.
```

9. The following is a list of possible reasons for failed communications:

- Defective 7700PB Serial Upgrade cable.
- Wrong communications port selected in the terminal program.

• Improper port settings in the terminal program. (Refer to step 7 for settings).

1.1.2.4. Part 3 – Uploading the new firmware

10. Upload the "*.bin" file supplied using the X-Modem transfer protocol of your terminal program. If you do not start the upload within 10 minutes the 7700PB Boot code will time out. You can restart the upgrade process by removing and reinstalling the module.

11. The boot code will indicate whether the operation was successful upon completion of the upload.

    For Example:

```
UPLOAD OKAY
7700PB COLD BOOT>  |
```

    The cursor to the right of the word "BOOT>" should be spinning for about 5 seconds then the module will reboot.

12. The following is a list of possible reasons for a failed upload:

    • If you get the message "transfer cancelled by remote" you must restart the terminal program and load the bin file, then remove and install the module again.
    • The supplied "*.bin" file is corrupt.
    • Wrong file specified to be uploaded.
    • The PCs' RS-232 communications port can't handle a port speed of 57600.
    • Noise induced into the 7700PB Serial Upgrade cable.

1.1.2.5. Part 4 – Completing the Upgrade

13. You can now close the terminal program and disconnect the RS-232 serial cable from the PC.

14. Remove the module from the frame and disconnect the 7700PB Serial Upgrade cable from the module. Restore the *UPGRADE* jumper to the RUN position

15. Reinsert the module into the frame.

The update procedure is now completed.

1.2. UPDATING THE FIRMWARE IN STANDALONE UNITS BASED ON THE 7700PB, 7700PB2 and 7730DAC BOARDS

Many of the 7700 series standalone units are based on the 7700PB, 7700PB2 or 7730DAC processing boards. These units are fitted with a COM port connector that can be connected to a PC with a straight through cable.

1.2.1. Requirements

You will need the following equipment in order to update the 7700PB Firmware

- PC with available communications port. The communication speed is 57600 baud, therefore a 486 PC or better with a 16550 UART based communications port is recommended.
- "Straight-thru" serial extension cable (DB9 female to DB9 male) or (DB25 female to DB9 male)
- Terminal program that is capable of Xmodem file transfer protocol. (such as HyperTerminal)
- New firmware supplied by Evertz.

1.2.2. Update Procedure 7700PB boards

1.2.2.1. Part 1 – Configuring the unit for Firmware upgrades

16. Connect the 9 pin male connector on the straight through serial extension cable to the COM port on the rear of the standalone unit. Connect the 9 pin female connector to the the PCs' RS-232 communications port

1.2.2.2. Part 2 – Terminal program Setup

17. Start the terminal program.

18. Configure the port settings of the terminal program as follows:

Baud	57600
Parity	no
Data bits	8
Stop bits	2
Flow Control	None

19. Apply power to the standalone unit. After the unit powers up, a banner with the boot code version information should appear in the terminal window. The cursor to the right of the word "BOOT>" should be spinning for about 5 seconds then the unit will continue to boot.

For example:

```
EVERTZ 7700PB MONITOR 1.0
COPYRIGHT 1997, 1998, 1999 EVERTZ MICROSYSTEMS LTD.
COLD BOOT |
```

20. The following is a list of possible reasons for failed communications:

- Defective 7700PB Serial Upgrade cable.
- Wrong communications port selected in the terminal program.
- Improper port settings in the terminal program. (Refer to step 7 for settings).

6. While the cursor is spinning press the <CTRL> and <X> keys on your computer keyboard at the same time, this should stop the cursor from spinning. The spinning prompt will only remain for about 5 seconds. You must press <CTRL-X> during this 5 second delay. If the unit continues to boot-up, simply cycle the power and repeat this step.

7. Hit the <ENTER> key on your computer once.

8. Type the word "upgrade", without quotes, and hit the <ENTER> key once.

9. The boot code will ask for confirmation. Type "y", without quotes.

10. You should now see a prompt asking you to upload the file.

1.2.2.3. Part 3 – Uploading the new firmware

11. Upload the "*.bin" file supplied using the X-Modem transfer protocol of your terminal program. If you do not start the upload within 10 minutes the 7700PB Boot code will time out. You can restart the upgrade process by removing and reinstalling the module.

12. The boot code will indicate whether the operation was successful upon completion of the upload.

    For Example:

```
UPLOAD OKAY
7700PB COLD BOOT>  |
```

13. The following is a list of possible reasons for a failed upload:

    • If you get the message "transfer cancelled by remote" you must restart the terminal program and load the bin file, then remove and install the module again.
    • The supplied "*.bin" file is corrupt.
    • Wrong file specified to be uploaded.
    • The PCs' RS-232 communications port can't handle a port speed of 57600.
    • Noise induced into the 7700PB Serial Upgrade cable.

1.2.2.4. Part 4 – Completing the Upgrade

14. Type the word "boot", without quotes, and hit the <ENTER> key once or power cycle the unit. The unit should now reboot.

15. You can now close the terminal program and disconnect the RS-232 serial cable from the PC.

The update procedure is now completed.

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REVISION HISTORY

REVISION	DESCRIPTION	DATE
0.1	Original Version - preliminary	June 99
0.2	Table of video formats expanded Block Diagram added Figure added showing card edge controls and jumper locations	Aug 99
0.3	On Screen Menu descriptions added	Oct 99
1.0	Genlock Reference info added, test signals updated	Nov 99
1.1	Updated DIP Switch information, added Clock locking function on genlock	Dec 99
1.2	Added new test signals as per firmware version 1.1 Build 81	Jan 00
1.3	Added new test signals as per firmware version 1.2 Build 12 Added On Screen Message menu support	Jun 00

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1. OVERVIEW

The 7750TG-HD Test Signal Generator provides a cost-effective method of generating 1.5 Gb/s HDTV test signals. The 7750TG-HD is ideal for checking signal path integrity, or to determine system performance over varying cable lengths. The 7750TG-HD generates test signals in a wide variety of SMPTE 292M video formats and offers four 1.5 Gb/s outputs.

The 7750TG-HD provides an analog genlock input that allows you to synchronize the test signals to your plant horizontal and vertical timing.

Separate audio tones can be embedded into each channel of one of the four embedded audio groups. The user can select which of the audio groups the tones will be embedded into.

Features:
- Wide variety of 1080i, 1035I, 1080p and 720p output formats
- 8 position DIP switch selects output format
- Card edge toggle switch selects test signal
- Selectable gen lock input format – bi-level or tri-level sync, colour black
- 4 embedded audio tones, selectable audio group assignment
- 4 output drivers
- On screen display of test signal names
- On screen setup menu
- Tally output upon loss of gen lock
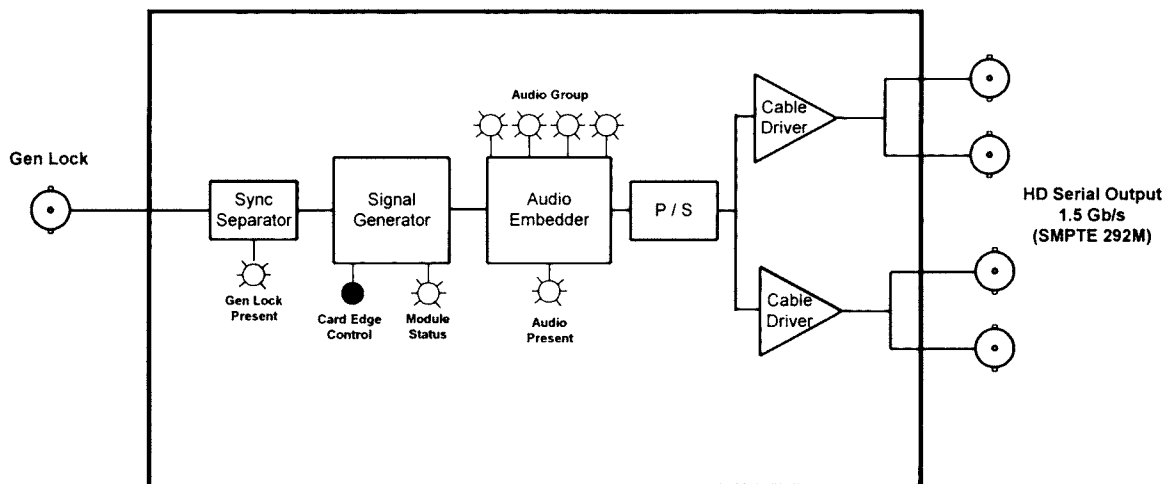- Front panel LEDs indicate gen lock presence, module fault and audio signal presence on the output

Figure 1: 7750TG-HD Block Diagram

2. INSTALLATION

The 7750TG-HD module comes with a companion rear plate that has 5 BNC connectors. For information on mounting the rear plate and inserting the module into the frame see the 7700FR chapter section 3.
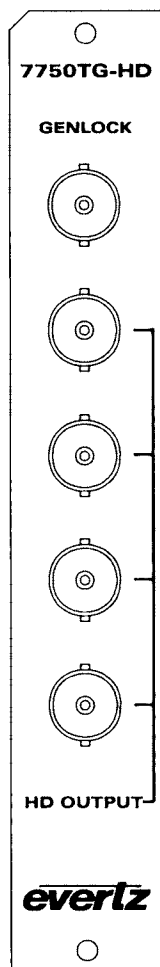

Figure 2: 7750TG-HD Rear Panel

GEN LOCK   Input BNC connector for analog Gen Lock reference. The genlock signal may be a HD tri-level sync or a standard definition colour black video or 0.3 V bi-level sync. DIP switches 6 and 7 used to configure the Genlock type. Table 3 gives a list of the valid reference signal types for the HD output video format you have selected. The *Reference Phase* On screen menu is used to set up the timing of the output signal with respect to the reference input. Jumper J2 on the A7700REF sub-module selects whether the reference input is terminated or high impedance. (See section 6.3)

HD OUTPUT   There are four BNC connectors with serial component video outputs compatible with the SMPTE 292M standard. The output video format is selected using DIP switches 1 to 5. (See Table 3) The test signal output is selected using the toggle switch located on the card edge. The *Audio Setup* On screen menu is used to configure any embedded audio that will be present on the outputs.

3. SPECIFICATIONS

3.1. GEN LOCK INPUT

Type: DIP switch selectable - depends on output video format (see Table 3)
HD Tri-level Sync
NTSC or PAL Colour Black 1 V p-p
Composite Bi-level sync (525I or 625I) 300 mV
Connector: 1 BNC per IEC 169-8
Termination: 75 ohm (jumper selectable)

3.2. HD SERIAL VIDEO OUTPUTS

Number of Outputs: 4.
Standard: SMPTE 292M, Selectable as per Table 3
Embedded Audio: Up to 4 tones in one audio group as specified in SMPTE 299M. Selectable tone frequencies (from 60 Hz to 10 kHz) and audio group
Connectors: 4 BNC per IEC 169-8
Signal Level: 800mV nominal
DC Offset: 0V ±0.5V
Rise and Fall Time: 200ps nominal
Overshoot: <10% of amplitude
Wide Band Jitter: < 0.15 UI

3.3. ELECTRICAL

Voltage: + 12VDC
Power: 6 Watts.
EMI/RFI: Complies with FCC Part 15, class A and EU EMC directive.

4. STATUS LEDS

4.1. MODULE STATUS LEDS

The location of the status LEDs is shown in Figure 5.

MODULE OK This Green LED will be On when the module is operating properly.

LOCAL FAULT This Red LED will blink on and off if the microprocessor is not running. The LED will be on solid when there is a fault in the module power supply.

SIGNAL PRESENT: This Green LED will be On when there is a valid genlock signal present at the module genlock input.

> This LED does not necessarily indicate that the genlock signal is the correct frame rate for the selected output video format. For example, if a 59.94 Hz signal is required for the selected output video format, but a 60 Hz signal is present at the genlock input, the SIGNAL PRESENT LED will be On. In this case the output video will NOT be properly referenced but will constantly try to re-sync to the genlock frame reference.

AUDIO: This Green LED will be On when there is audio embedded into the outputs.

4.2.   AUDIO GROUP STATUS LEDS

Four LEDs located on the lower end of the module (opposite the DIP switch) indicate the presence of embedded audio in the output video. The audio group LED 1 is located closest to the center of the module.

Audio Group LED	Color	Audio Group Status
1	Off	There is no group 1 audio on the video output.
	On	Group 1 audio is being embedded.
2	Off	There is no group 2 audio on the video output.
	On	Group 2 audio is being embedded.
3	Off	There is no group 3 audio on the video output.
	On	Group 3 audio is being embedded.
4	Off	There is no group 4 audio on the video output.
	On	Group 4 audio is being embedded.

Table 1: Audio Group Status LEDs

5.   CARD EDGE CONTROLS

The 7750TG-HD is equipped with an 8 position DIP switch to allow the user to select various output video formats. A three position, return to center toggle switch is used to select the various test signal patterns and is also used in conjunction with a momentary pushbutton to operate the On screen Setup menu. Table 2 gives an overview of the DIP switch functions.

DIP Switch	Function
1	
2	
3	Video Output Format Selection
4	
5	
6	
7	Gen Lock Format Selection
8	

Table 2: DIP Switch Functions

5.1.   SELECTING THE OUTPUT VIDEO FORMAT

DIP switches 1 to 5 are used to select the output video format of the 7750TG-HD. The On position is down, or closest to the printed circuit board. Table 3 shows the settings of the DIP switches for selecting the video output formats, and the types of genlock signals that can be used with each.

DIP Switch					Common Name	Pixels x Active Lines	Frame Rate	Progressive /Interlace	Valid Genlock Types	
1	2	3	4	5					Bi-Level (DIP 7 Off)	Tri-Level (DIP 7 On)
Off	Off	Off	Off	Off	1080i/60	1920 x 1080	30	I	525/60	1080i/60 1035i/60 1080p/30 1080p/30sF
On	Off	Off	Off	Off	1080i/59.94	1920 x 1080	29.97 (30/1.001)	I	525/59.94	1080i/59.94 1035i/59.94 1080p/29.97 1080p/29.97sF
Off	On	Off	Off	Off	1080i/50	1920 x 1080	25	I	625/50	1080i/50 1080p/25 1080p/25sF
On	On	Off	Off	Off	1080p/30	1920 x 1080	30	P	525/60	1080i/60 1035i/60 1080p/30 1080p/30sF
Off	Off	On	Off	Off	1080p/30sF	1920 x 1080	30	P (sF)	525/60	1080i/60 1035i/60 1080p/30 1080p/30sF
On	Off	On	Off	Off	1080p/29.97	1920 x 1080	29.97 (30/1.001)	P	525/59.94	1080i/59.94 1035i/59.94 1080p/29.97 1080p/29.97sF
Off	On	On	Off	Off	1080p/29.97sF	1920 x 1080	29.97 (30/1.001)	P (sF)	525/59.94	1080i/59.94 1035i/59.94 1080p/29.97 1080p/29.97sF
On	On	On	Off	Off	1080p/25	1920 x 1080	25	P	625/50	1080i/50 1080p/25 1080p/25sF
Off	Off	Off	On	Off	1080p/25sF	1920 x 1080	25	P (sF)	625/50	1080i/50 1080p/25 1080p/25sF
On	Off	Off	On	Off	1080p/24	1920 x 1080	24	P	625/48	1080p/24 1080p/24sF
Off	On	Off	On	Off	1080p/24sF	1920 x 1080	24	P (sF)	625/48	1080p/24 1080p/24sF
On	On	Off	On	Off	1080p/23.98	1920 x 1080	23.98 (24/1.001)	P	625/47.95	1080p/23.98 1080p/23.98sF
Off	Off	On	On	Off	1080p/23.98sF	1920 x 1080	23.98 (24/1.001)	P (sF)	625/47.95	1080p/23.98 1080p/23.98sF
On	Off	On	On	Off	720p/60	1280 x 720	60	P	525/60	720p/60
Off	On	On	On	Off	720p/59.94	1280 x 720	59.94 (60/1.001)	P	525/59.94	720p/59.94
On	On	On	On	Off	1035i/60	1920 x 1035	30	I	525/60	1080i/60 1080p/30 1080p/30sF 1035i/60
Off	Off	Off	Off	On	1035i/59.94	1920 x 1035	29.97 (30/1.001)	I	525/59.94	1080i/59.94 1080p/29.97 1080p/29.97sF 1035i/59.94

Table 3: Video Format DIP Switch Settings

5.2. SELECTING THE GEN LOCK REFERENCE TYPE

The 7750TG-HD can free run on its internal crystal oscillator or be referenced to a genlock signal applied to the GEN LOCK input. The genlock signal may be a HD tri-level sync or a standard definition colour black video or 0.3 V bi-level sync. DIP switches 6, 7 and 8 used to configure the genlock type. Table 3 gives a list of the valid reference signal types for the HD output video format you have selected. DIP switch 6 selects if the 7750TG-HD will free run or be referenced to the genlock Reference video. DIP switch 7 selects the type of genlock reference being supplied. The *Reference Phase* On screen menu is used to set up the timing of the output signal with respect to the reference input. (See section 5.4.2) DIP switch 8 selects whether the genlock reference is used to phase the output video or just lock the clock rate.

DIP 8	DIP 7	DIP 6	Genlock Reference
Off	Off	Off	The 7750TG-HD will free run on its internal crystal oscillator.
Off	On	Off	
On	Off	Off	
On	On	Off	
Off	Off	On	The genlock reference signal is a Standard Definition colour black video or bi-level sync. The output video will be phase locked to the bi-level genlock reference. See Table 2 for reference types supported.
Off	On	On	The genlock reference signal is a High Definition tri-level sync. The output video will be phase locked to the Tri-Level genlock reference. See Table 2 for reference types supported.
On	Off	On	The genlock reference signal is NTSC colour black video. The output video will be phase locked to the NTSC genlock reference if possible (See Table 2 for output video formats that can be phase locked to NTSC). Other output video formats will be clock locked only.
On	On	On	Reserved, do not use.

Table 4: Gen Lock Reference Switch Settings

5.3. SELECTING THE TEST SIGNAL

When the 7750TG-HD is not in the on screen setup menu, the toggle switch located on the front edge of the module is used to select test signal generated. Each time the toggle switch is pressed down the 7750TG-HD advances to the next test signal. Each time the toggle switch is pressed up the 7750TG-HD changes to the previous test signal. The name of the current test signal is shown momentarily on the lower left corner of the screen. Table 5 shows the test signals that are available. Most of the test signals are industry standard signals. Sections 5.3.1.1 to 5.3.1.3 describe the test signals that are unique to the 7750TG-HD.

	Some test signals are not available on certain video formats.

Test Signal Name	Test Signal Name
75% Color bars with pluge	60% Component Sweep (1-30 MHz) with 5 MHz Markers
100% Color bars with pluge	60% Component Sweep (15-30 MHz) with 2 MHz Markers
75% Color bars	60% Component Multiburst (1, 2, 4, 6, 8, 10 MHz)
100% Color bars	60% Component Multiburst (10, 12, 14, 16, 18, 20 MHz)
White Field	60% Component Multiburst (20, 22, 24, 26, 28, 30 MHz)
Black	100% Component Multiburst (1, 2, 4, 6, 8, 10 MHz)
Circle with Center Cross	100% Component Multiburst (10, 12, 14, 16, 18, 20 MHz)
Clean Aperture with Graticule	100% Component Multiburst (20, 22, 24, 26, 28, 30 MHz)
Clean Aperture with Center	Component Multipulse (5, 10, 15, 20, 25 MHz)
Clean Aperture	60% Y Line Sweep (1-30 MHz) with 5 MHz Markers
Production Aperture	60% Y Line Sweep (15-30 MHz) with 2 MHz Markers
Grey	60% Y Multiburst (1, 2, 4, 6, 8, 10 MHz)
Grey (all data bits active)	60% Y Multiburst (10, 12, 14, 16, 18, 20 MHz)
SDI Checkfield	60% Y Multiburst (20, 22, 24, 26, 28, 30 MHz)
Valid 5 Step	100% Y Multiburst (1, 2, 4, 6, 8, 10 MHz)
Field ID	100% Y Multiburst (10, 12, 14, 16, 18, 20 MHz)
Frame ID	100% Y Multiburst (20, 22, 24, 26, 28, 30 MHz)
5 Step Staircase	Y Multipulse (5, 10, 15, 20, 25 MHz)
Bowtie	100% White Window
75% Split field reverse bars with pluge	80% White Window
Valid Ramp	50% White Window
	20% White Window
	12% White Window

Table 5: Test Signal Selection

5.3.1. Description Of Unique Test Signals

This section describes features of some of the more unique test signals.

5.3.1.1. Clean Aperture with Graticule

This signal contains a number of key physical dimensions of the HDTV active picture area. It divides the 16x9 aspect ratio clean aperture area into an 8x6 graticule grid. The center 6x6 grid corresponds to a 4x3 aspect ratio rectangle that is concentric with the 16x9 clean aperture. The edges of the 4x3 area have different line patterns to help in identifying it. The clean aperture markers are placed so that the center of the lines is at the clean aperture. The production aperture markers are placed so that the outsides of the lines are at the production aperture (the extent of the total image). A center cross marker is also included to mark the middle of the image.

5.3.1.2. Production Aperture

Single horizontal lines and single pixel vertical borders around the active picture mark the production aperture. Single pixels and single horizontal lines are not legal for normal pictures but this test signal is designed to test equipment to make sure it is processing/passing the whole image area. If any side of the box is missing, then the device under test is not passing the whole production aperture.

5.3.1.3. The Grey Signals

These signals can be used as a 50% full field grey, and they are also designed to provide a best case and a worse case toggle rate on the test signal data bits. The regular *Grey* signal has both the luminance and the chrominance values set to 200hex, while the *Grey with all data bits active* signal has both the luminance and the chrominance bits alternating between 200hex and 1FFhex. The latter signal has every data bit toggling every video sample.

Most current digital logic designs use CMOS technology where the power consumed and the heat produced are proportional to the average toggle rate of all of the flip flops in the product. If a product performs a large amount of video processing (in proportion to all processing), and then there will be a power consumption difference between a "quiet" signal and a "very active" signal. The grey signals can be used as a best case and a worst case condition for checking such conditions.

5.4. CONFIGURING THE TEST GENERATOR USING THE ON SCREEN MENU

An On screen menu (OSD) is used to configure many of the test generator's parameters. The three position, return to center, **toggle switch** and momentary **pushbutton** located on the front edge of the module are used to navigate the OSD setup menus and configure the cards various controls.

To enter the OSD menu system, press the push button once. This will bring you to the main setup menu where you can use the **toggle switch** to move up and down the list of available sub menus. An arrow (>) moves up and down the left hand side of the menu items to indicate which item you are currently choosing. Once the arrow is on the desired item, press the **pushbutton** to select the next menu.

On all menus, there is a selectable item *Done*. Selecting *Done* will take you to the previous menu (the one that was used to get into the menu). If you are at the top level of the menu tree then selecting *Done* will exit the OSD menu and return the 7750TG-HD to the normal operating mode.

Once you are in a sub menu, there may be another menu level, or there may be a list of parameters to adjust. If there is another set of menu choices, use the toggle switch to select the next choice with the same procedure as in the main menu.

If there is a list of parameters to adjust, use the **toggle switch** to move up or down to the desired parameter and press the **pushbutton**. The arrow will move to the right hand side (<) indicating that you can now adjust the parameter. Using the toggle switch, adjust the parameter to its desired value. If the parameter is a numerical value, the number will increase if you lift the toggle switch and decrease if you push down on the toggle switch. If the parameter contains a list of choices, you can cycle through the list by pressing the toggle switch in either direction.

When you have stopped at the desired value, depress the **pushbutton**. This will update the parameter with the selected value and move the arrow back to the left side of the parameter list. Continue selecting and adjusting other parameters or use the *Done* commands to return to the next higher menu level.

5.4.1. Top Level Menu Structure

The following is a brief description of the top level of the menu tree that appears when you enter the On screen menu. Selecting one of these items will take you down into the next menu level.

Reference Phase	Sets the timing phase of the test signal to the Gen Lock reference input.
Audio Setup	Configure what audio tones will be embedded into the test signal, and which audio group will be used.
On Screen Message	Configure the On screen message.
Done	Exit On Screen Menu System

5.4.2. Setting the Timing of the Output Video with Respect to the Gen Lock Input

The *Reference Phase* menu is used to set the timing of the output video to the Gen Lock Reference. The V and H parameters allow you to control the timing of the output video with respect to the beginning of the frame on the Gen Lock reference input. An internally generated digital video sync structure, locked to analog genlock reference signal is used to genlock the 7750TG-HD test generator. The EAV of line 1 of this digital reference sync is the point to which all the Reference phasing adjustments are made. Figure 3 and Figure 4 show the relationship of the analog tri-level and bi-level inputs to the digital reference sync frame.
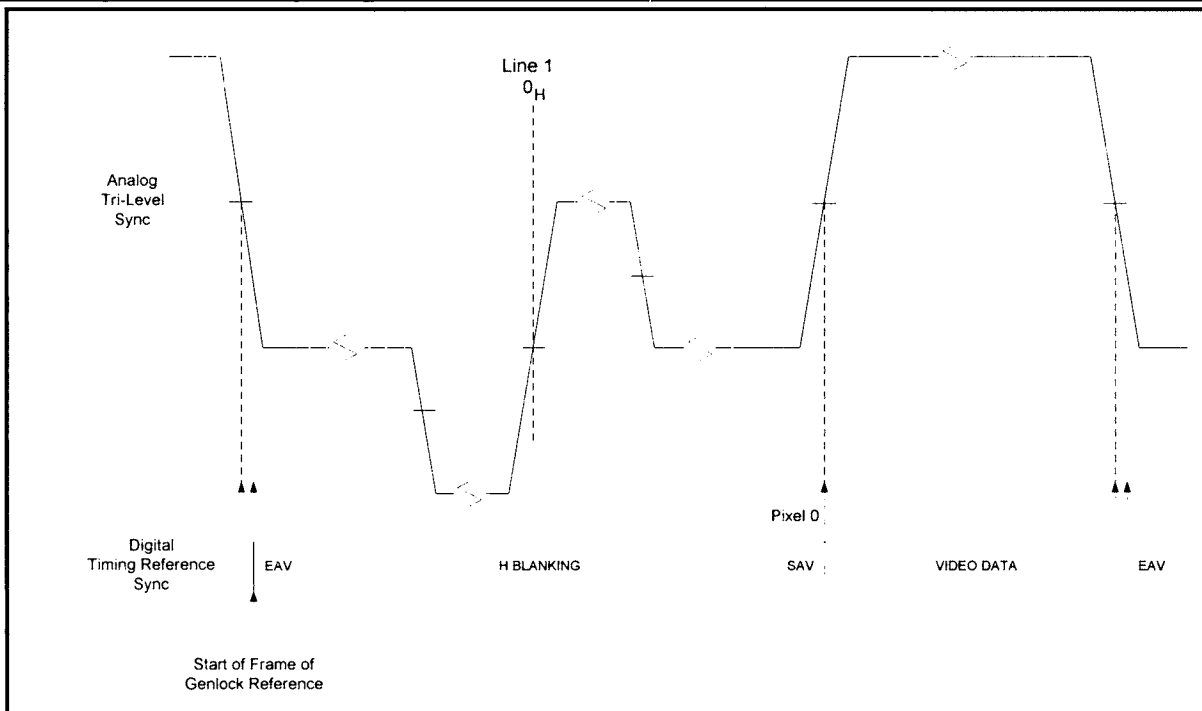
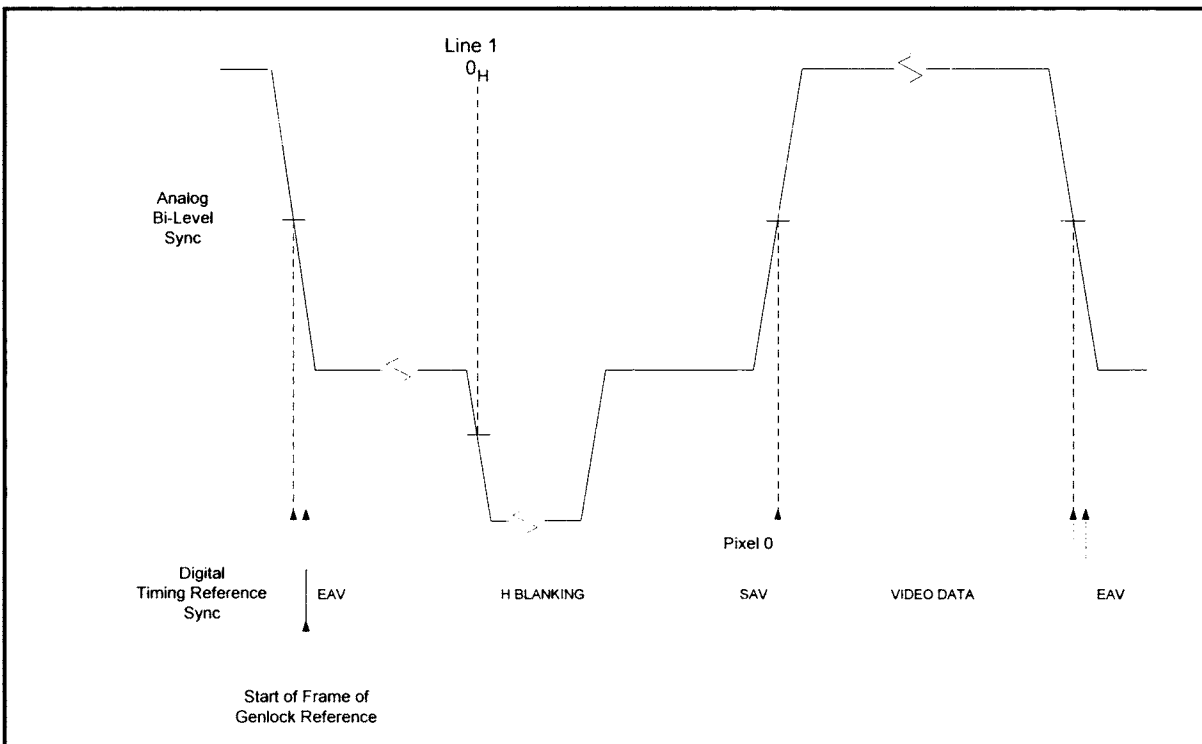**Figure 3: Tri-Level Reference Timing**

Figure 4: Bi-Level Reference Timing

The V parameter provides a coarse adjustment of timing and sets the line number of the output video that will be aligned with beginning of the reference frame. The H parameter provides a fine adjust of timing and sets the pixel number of the line on the output video set by the V parameter that will be aligned with

the beginning of the reference frame. If adjustments to the H parameter cause it roll through the pixel number at the start of a new line (the EAV) then the V parameter will change to the next higher or lower line. The factory default is to align the EAV of Line 1 of the output video with the beginning of the reference frame.

5.4.3. Configuring 7750TG-HD Embedded Audio Parameters

The Audio Setup menu is used to select the audio group where embedded audio will be placed, and the frequency of the tones that will be put into each of the 4 embedded audio channels.

Group:	Selects the Audio Group where embedded audio will be placed.
Ch. 1:	Selects the audio signal for Audio Channel 1.
Ch. 2:	Selects the audio signal for Audio Channel 2.
Ch. 3:	Selects the audio signal for Audio Channel 3.
Ch. 4:	Selects the audio signal for Audio Channel 4.
Done	Return to main menu

5.4.3.1. Audio Group Selection

The *Group* parameter selects the Audio Group where embedded audio will be placed.

AUDIO		
GROUP:		
	Off	No audio will be embedded in the video output.
	1, 2, 3, 4	Up to 4 groups of audio may be embedded in the output video. Audio will be embedded into the selected group. There are four green LED's under the DIP switches that indicate which of the four groups audio is being embedded into.

5.4.3.2. Audio Channel Selection

Each Audio Group has four audio channels. The *Ch 1, Ch 2, Ch 3,* and *Ch 4* parameters select the Audio signal that will be embedded into each of the 4 channels of the audio group selected by the *Audio Group* parameter.

AUDIO		
Ch 1		
	Mute	Embedded audio in this channel will be silent.
	60 Hz 100 Hz 200 Hz 400 Hz 800 Hz 1.0 kHz 1.6 kHz 2.0 kHz 3.2 kHz 4.0 kHz 5.0 kHz 6.4 kHz 8.0 kHz 10 kHz	Selecting one of these signals will set the frequency of the tone that is embedded into this channel.

5.4.4. Configuring the On Screen Message Display

The 7750TG has a programmable 16-character text message that may be used to display a source identification message or any other information on the screen. The *On Screen Display* menu is used to enter the text message, to turn it on and off and set the position on the screen. The *On Screen Display* menu is also used to set the length of time that signal name display is on after the user changes the test signal.

Message Display	Turns the message display on and off.
Message	Edit the On screen message.
Set Message Position	Sets horizontal and vertical position of the message on the screen.
Signal Name Duration	Set the duration that the signal name display is on after test signal changes.
Done	Exit On Screen Menu System

5.4.4.1. Editing the On Screen Message Display

The *Message* submenu is used to edit the text message. When you enter the *message* submenu, the actual text message is displayed on the top line.

TEXT MESSAGE	Edit the message.
Clear	Clears the complete message to space characters
Justify	Used to move the message within the 16 char text message block
Done	Exit On Screen Display Menu System

To edit the message, press the pushbutton when the > indicator is on the left of the message. The ^ indicator will appear under the left character of the message. Use the toggle switch to change the character indicated by the ^ or press the pushbutton to advance to the next character. When you have finished editing the message the > will automatically appear to the left of the message. Use the toggle switch to select the *Clear, Justify* or *Done* menu items and press the pushbutton to exit the *Message* submenu.

5.4.4.2. Positioning the On Screen Message Display

The *Position Message* submenu is used to position the text message on the character raster. When you enter the *Position Message* submenu, a box the size of the maximum length message will appear on the screen. Use the toggle switch to move the box horizontally. When you press the pushbutton you will be able to move the box vertically on the screen using the toggle switch. Press the pushbutton quickly twice to exit the *Position Message* submenu.

Messages that are shorter than 16 characters can be moved within the 16-character text box using the *Justify* submenu item. This allows shorter messages to be positioned all the way to the left or right side of the screen

5.4.4.3. Setting the Display Time for the Signal Name Display

The *Signal Name Display* menu item is used to set the length of time the On screen signal name is displayed after the user selects a new signal. Use the toggle switch to select a duration in seconds. The Signal name display can also be turned permanently *On* or *Off*.
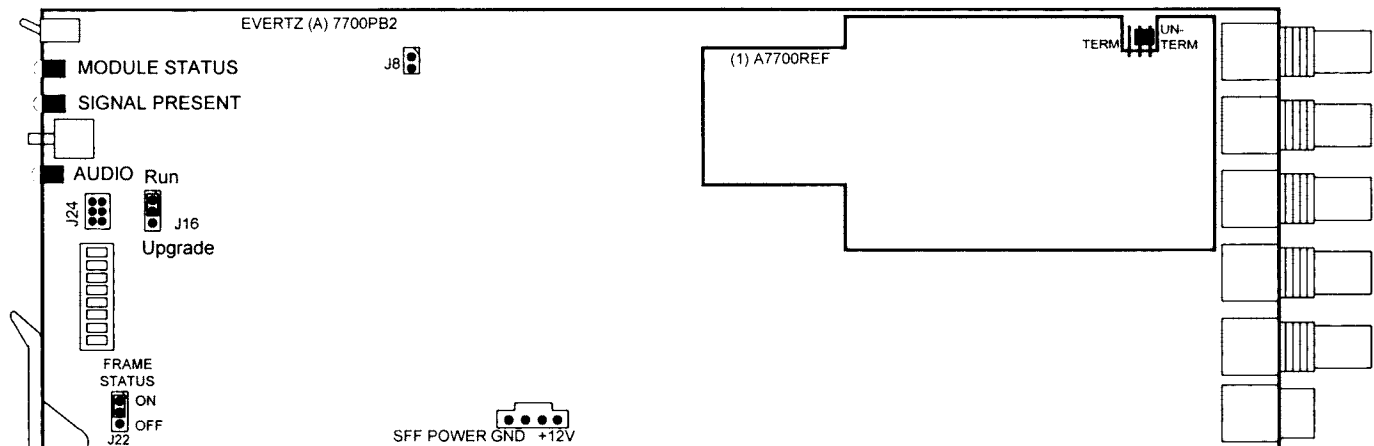
6.   JUMPERS

Figure 5: Location of Jumpers

6.1.   SELECTING WHETHER LOCAL FAULTS WILL BE MONITORED BY THE GLOBAL FRAME STATUS

FRAME STATUS   The FRAME STATUS jumper J22 located at the front of the module determines whether local faults (as shown by the Local Fault indicator) will be connected to the 7700FR frame's global status bus.

To monitor faults on this module with the frame status indicators (on the PS FRAME STATUS LED's and on the Frame's Fault Tally output) install this jumper. (Default) When this jumper is removed, local faults on this module will not be monitored. For convenience you may re-install the jumper so that only one side is connected.

6.2.   CONFIGURING THE MODULE FOR FIRMWARE UPGRADES

UPGRADE   The UPGRADE jumper J16 located at the front of the module is used when firmware upgrades are being done to the module. For normal operation it should be installed in the *RUN* position. On Rev 1 versions of this board the upgrade jumper is located in another location. See the *Upgrading Firmware* section of this manual for more information.

To upgrade the firmware in the module unit pull it out of the frame. Move Jumper J16 into the *UPGRADE* position. Install the Upgrade cable provided (located in the vinyl pouch in the front of this manual) onto header J24 at the card edge. Re-install the module into the frame. Run the upgrade as described in the *Upgrading Firmware* section of this manual. Once the upgrade is completed, remove the module from the frame, move J16 into the *RUN* position, remove the upgrade cable and re-install the module. The module is now ready for normal operation.

6.3.   SELECTING WHETHER THE GENLOCK REFERENCE INPUT IS TERMINATED

TERM/UNTERM   The TERM/UNTERM jumper J2 located on the A7700REF gen lock submodule is used to terminate the gen lock input. Then it is in the TERM position a 75 ohm terminating resistor will be connect the input to ground. When it is in the UNTERM position the gen lock input will be high impedance.

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Tables

REVISION HISTORY

REVISION	**DESCRIPTION**	**DATE**
1.0	Original Version	Mar 00
1.1	Table 1 updated, Section 5.2 added	Apr 00
1.2	Table 2 updated to add new signals and genlock phasing Genlock Phase adjustments added	Jun 00

1.   OVERVIEW

The 7750SRG-HD generates various analog bi-level and tri-level sync signals for both HD and SD applications. The 7750SRG-HD provides an analog genlock input that allows you to synchronize the sync signals to your plant horizontal and vertical timing.

The 7750SRG-HD generates all analog sync signals defined by SMPTE 274M (1080i/p) and 296M (720p) as well as those required for NTSC, PAL and slow PAL (625i/48) applications. The four independent sync outputs can be configured to output different sync signals. The common combinations of HDTV and SD analog sync outputs can be selected via card edge control.

In conjunction with the 7700ADA-HD Analog Distribution Amplifier and the 7750TG-HD HDTV Test Signal Generator, this module will fulfill all of your slave sync generation requirements. (7750RGTS-HD system brochure for details on our HDTV Reference Generator Test Set System applications)

Features:
- NTSC or PAL colour black gen lock or free-runs with no gen lock reference
- Phase adjustment of outputs with respect to gen lock input
- Selectable frame rate divisor of 1 or 1/1.001
- Wide variety of 1080I, 1035I, 1080p, 720p, NTSC, PAL and slow PAL sync output sync signals
- 4 separate analog sync signal outputs
- 8 position DIP switch selects combinations of sync signals available
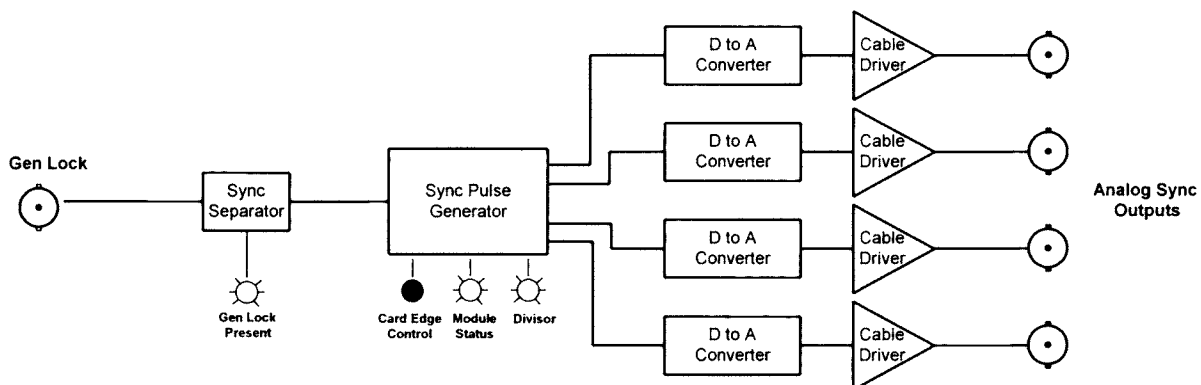- Front panel LEDs indicate gen lock presence, module fault

Figure 1: 7750SRG-HD Block Diagram

2. INSTALLATION

The 7750SRG-HD module comes with a companion rear plate that has 5 BNC connectors. For information on mounting the rear plate and inserting the module into the frame see the 7700FR chapter section 3.
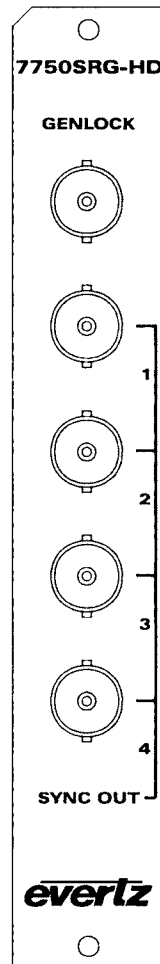

Figure 2: 7750SRG-HD Rear Panel

GEN LOCK   Input BNC connector for analog Gen Lock reference. The genlock signal may be an NTSC or PAL colour black video or 0.3 V bi-level sync. Table 2 gives a list of the valid reference signal types for the output signal combination you have selected, and whether the outputs will be phase locked or clock locked to the genlock reference. DIP switches 6 and 7 select whether the outputs will be genlocked, and whether the default phasing or user set phasing will be used. Jumper J2 on the 7700REF submodule selects whether the reference input is terminated or high impedance. (See section 6.3)

SYNC OUTPUT   There are four BNC connectors with various combinations of analog sync outputs. The output signals available are selected using DIP switches 1 to 5 (See Table 2)

3.   SPECIFICATIONS

3.1.   GEN LOCK INPUT

Type: Depends on output video format (see Table 2)
                                 NTSC or PAL Colour Black 1 V p-p
                                 Composite Bi-level sync (525i/59.94 or 625i/50) 300 mV
Connector: 1 BNC per IEC 169-8
Termination: 75 ohm (jumper selectable)

3.2.   ANALOG SYNC OUTPUTS

Number of Outputs: 4.
Standard: SMPTE 274M, 296M, NTSC, PAL, 6Hz TTL Pulse - Selectable as per Table 2
Connectors: 4 BNC per IEC 169-8
Signal Level: HD Sync outputs: 600 mV nominal tri-level
                         SD Sync outputs: 300 mv nominal bi-level
                         6 Hz output: TTL

3.3.   ELECTRICAL

Voltage: + 12VDC
Power: 6 Watts.
EMI/RFI: Complies with FCC Part 15, class A and EU EMC directive.

4.   STATUS LEDS

4.1.   MODULE STATUS LEDS

The location of the status LEDs is shown in Figure 5.

MODULE OK   This Green LED will be On when the module is operating properly.

LOCAL FAULT   This Red LED will blink on and off if the microprocessor is not running. The LED
                    will be on solid when there is a fault in the module power supply.

SIGNAL PRESENT: This Green LED will be On when there is a valid genlock signal present at the
                    module genlock input.

This LED does not necessarily indicate that the genlock signal is the correct frame rate for the selected sync output format. For example, if a 59.94 Hz signal is required for the selected output video format, but a 50 Hz signal is present at the genlock input, the SIGNAL PRESENT LED will be On. In this case the output video will NOT be properly referenced but will constantly try to re-sync to the genlock frame reference.

DIVISOR: This Green LED will be On when the Slave Reference generator is operating with the 1/1.001 Divisor enabled. This mode is selected when DIP switch 1 in On.

5. CARD EDGE CONTROLS

The 7750SRG-HD is equipped with an 8 position DIP switch to allow the user to select various output signals available formats. It is also used to select the genlock reference type and phase alignment, and whether the system rate divisor is 1 or 1/1.001. A three position, return to center toggle switch is used in conjunction with a momentary pushbutton to adjust the phase of the outputs with respect to the genlock reference. Table 1 gives an overview of the DIP switch functions.

DIP Switch	Function
1	1/1001 Divisor Enable
2	Output Signal Selection
3	
4	
5	
6	Genlock/ Free Run Selection
7	Genlock phasing
8	Reserved

Table 1: DIP Switch Functions

5.1. SELECTING THE OUTPUT SYNC SIGNALS

DIP switches 1 to 5 are used to select the combination of sync output signals present on the four BNC outputs of the 7750SRG-HD. The On position is down, or closest to the printed circuit board. Table 2 shows the settings of the DIP switches for selecting the video output formats, and the types of genlock signals that can be used with each.

Outputs 1 and Output 2 usually contain tri-level sync pulses for the various high definition formats. Outputs 3 and 4 contain either bi-level standard definition sync pulses or a 6Hz or 1 Hz sequence pulse. The sequence pulses are one field (of the higher frame rate) in duration and occur when line 1 of output 1 and line 1 of output 2 coincide.

	DIP Switch					Output				Genlock		
#	1	2	3	4	5	1	2	3	4	Type	Lock	Phased Outputs
1	Off	Off	Off	Off	Off	1080i/60	1080p/24sF	625i/48	6Hz Pulse	NTSC	Clock	---
2	On	Off	Off	Off	Off	1080i/59.94	1080p/23.98sF	625i/47.96	6Hz Pulse	NTSC	Phase	1
3	Off	On	Off	Off	Off	1080i/50	1080p/24sF	625i/48	1Hz Pulse	PAL	Phase	1
4	On	On	Off	Off	Off	Reserved	Reserved	Reserved	Reserved	---	---	---
5	Off	Off	On	Off	Off	1080p/30	1080p/24sF	625i/48	6Hz Pulse	NTSC	Clock	---
6	On	Off	On	Off	Off	1080p/29.97	1080p/23.98sF	625i/47.96	6Hz Pulse	NTSC	Phase	1
7	Off	On	On	Off	Off	1080p/25	1080p/24sF	625i/48	1Hz Pulse	PAL	Phase	1
8	On	On	On	Off	Off	Reserved	Reserved	Reserved	Reserved	---	---	---
9	Off	Off	Off	On	Off	1080p/24	1080p/24sF	625i/48	625i/48	NTSC	Clock	---
10	On	Off	Off	On	Off	1080p/23.98	1080p/23.98sF	625i/47.96	625i/47.96	NTSC	Clock	---
11	Off	On	Off	On	Off	1080p/24sF	1080p/24sF	625i/48	625i/48	NTSC	Clock	---
12	On	On	Off	On	Off	1080p/23.98sF	1080p/23.98sF	625i/47.96	625i/47.96	NTSC	Clock	---
13	Off	Off	On	On	Off	720p/60	720p/24	625i/48	6Hz Pulse	NTSC	Clock	---
14	On	Off	On	On	Off	720p/59.94	720p/23.98	625i/47.96	6Hz Pulse	NTSC	Phase	1
15	Off	On	On	On	Off	1035i/60	1080p/24sF	625i/48	6Hz Pulse	NTSC	Clock	---
16	On	On	On	On	Off	1035i/59.94	1080p/23.98sF	625i/47.96	6Hz Pulse	NTSC	Phase	1
17	Off	Off	Off	Off	On	1080i/60	720p/60	525i/59.94	525i/59.94	NTSC	Clock	---
18	On	Off	Off	Off	On	1080i/59.94	720p/59.94	525i/59.94	525i/59.94	NTSC	Phase	1,2,3,4
19	Off	On	Off	Off	On	60 V drive	1080p/24sF	625i/48	6 Hz Pulse	NTSC	Clock	---
20	On	On	Off	Off	On	59.94 V drive	1080p/23.98sF	625i/47.96	6 Hz Pulse	NTSC	Phase	1
21	Off	Off	On	Off	On	1080p/24	1080p/24sF	625i/48	625i/48	PAL	Phase	1
22	On	Off	On	Off	On	1080i/59.94	1080p/23.98sF	625i/50	625i/50	NTSC	Clock	
23	Off	On	On	Off	On	1080i/50	1080p/24sF	525i/59.94	525i/59.94	PAL	Clock	
24	On	On	On	Off	On	Reserved	Reserved	Reserved	Reserved	---	---	---
25	Off	Off	Off	On	On	1980i/30	1650i/38.30	625i/50	625i/50	PAL	Clock	
26	On	Off	Off	On	On	1980i/29.97	1650i/38.26	525i/59.94	525i/59.94	NTSC	Clock	
27	Off	On	Off	On	On	1080i/59.94	1080p/23.98sF	525i/59.94	6 Hz Pulse	NTSC	Phase	1
28	On	On	Off	On	On	1080i/59.94	1080p/23.98sF	525i/47.69	6 Hz Pulse	NTSC	Phase	1
29	Off	Off	On	On	ON	1080p/25	1080i/50	625i/50	625i/50	PAL	Phase	1,2,3,4

Table 2: Sync Output Selection Switch Settings

*Note 1: sync output selections 13 an 14 in table 2 are not implemented at this time.
‡Note 2: sync outputs for High Speed Dual Link 2K Data Transfers

5.2. SELECTING THE GEN LOCK REFERENCE

The 7750SRG-HD will free run on its internal crystal oscillator or be referenced to a genlock signal applied to the GEN LOCK input. The genlock signal is a standard definition colour black video or 0.3 V bi-level sync. DIP switch 6 selects if the 7750SRG-HD will free run or be referenced to the genlock Reference video as shown in Table 3.

DIP 6	FUNCTION	DESCRIPTION
Off	Free Run (default)	The 7750SRG-HD will free run on its internal crystal oscillator.
On	Gen Lock	The 7750SRG-HD sync outputs will be phase locked, or clock locked to a Standard Definition colour black video or bi-level sync signal as shown in Table 2.

Table 3: Gen Lock Reference Switch Settings

DIP Switch					Common Name	Pixels x Active Lines	Frame Rate	Progressive /Interlace	Valid Genlock Types	
1	2	3	4	5					Bi-Level	Tri-Level
Off	Off	Off	Off	Off	1080i/60	1920 x 1080	30	I	525/60	1080i/60 1035i/60 1080p/30 1080p/30sF
On	Off	Off	Off	Off	1080i/59.94	1920 x 1080	29.97 (30/1.001)	I	525/59.94	1080i/59.94 1035i/59.94 1080p/29.97 1080p/29.97sF
Off	On	Off	Off	Off	1080i/50	1920 x 1080	25	I	625/50	1080i/50 1080p/25 1080p/25sF
On	On	Off	Off	Off	1080p/30	1920 x 1080	30	P	525/60	1080i/60 1035i/60 1080p/30 1080p/30sF
Off	Off	On	Off	Off	1080p/30sF	1920 x 1080	30	P (sF)	525/60	1080i/60 1035i/60 1080p/30 1080p/30sF
On	Off	On	Off	Off	1080p/29.97	1920 x 1080	29.97 (30/1.001)	P	525/59.94	1080i/59.94 1035i/59.94 1080p/29.97 1080p/29.97sF
Off	On	On	Off	Off	1080p/29.97sF	1920 x 1080	29.97 (30/1.001)	P (sF)	525/59.94	1080i/59.94 1035i/59.94 1080p/29.97 1080p/29.97sF
On	On	On	Off	Off	1080p/25	1920 x 1080	25	P	625/50	1080i/50 1080p/25 1080p/25sF
Off	Off	Off	On	Off	1080p/25sF	1920 x 1080	25	P (sF)	625/50	1080i/50 1080p/25 1080p/25sF
On	Off	Off	On	Off	1080p/24	1920 x 1080	24	P	625/48	1080p/24 1080p/24sF
Off	On	Off	On	Off	1080p/24sF	1920 x 1080	24	P (sF)	625/48	1080p/24 1080p/24sF
On	On	Off	On	Off	1080p/23.98	1920 x 1080	23.98 (24/1.001)	P	625/47.95	1080p/23.98 1080p/23.98sF
Off	Off	On	On	Off	1080p/23.98sF	1920 x 1080	23.98 (24/1.001)	P (sF)	625/47.95	1080p/23.98 1080p/23.98sF
On	Off	On	On	Off	720p/60	1280 x 720	60	P	525/60	720p/60
Off	On	On	On	Off	720p/59.94	1280 x 720	59.94 (60/1.001)	P	525/59.94	720p/59.94
On	On	On	On	Off	1035i/60	1920 x 1035	30	I	525/60	1080i/60 1080p/30 1080p/30sF 1035i/60
Off	Off	Off	Off	On	1035i/59.94	1920 x 1035	29.97 (30/1.001)	I	525/59.94	1080i/59.94 1080p/29.97 1080p/29.97sF 1035i/59.94

Table 3: Video Format DIP Switch Settings

DIP Switch					Output				Genlock		
1	2	3	4	5	1	2	3	4	Type	Lock	Phased Outputs
Off	Off	Off	Off	Off	1080i/60	1080p/24sF	625i/48	6Hz Pulse	NTSC	Clock	---
On	Off	Off	Off	Off	1080i/59.94	1080p/23.98sF	625i/47.96	6Hz Pulse	NTSC	Phase	1
Off	On	Off	Off	Off	1080i/50	1080p/24sF	625i/48	1Hz Pulse	PAL	Phase	1
On	On	Off	Off	Off	Reserved	Reserved	Reserved	Reserved	---	---	---
Off	Off	On	Off	Off	1080p/30	1080p/24sF	625i/48	6Hz Pulse	NTSC	Clock	---
On	Off	On	Off	Off	1080p/29.97	1080p/23.98sF	625i/47.96	6Hz Pulse	NTSC	Phase	1
Off	On	On	Off	Off	1080p/25	1080p/24sF	625i/48	1Hz Pulse	PAL	Phase	1
On	On	On	Off	Off	Reserved	Reserved	Reserved	Reserved	---	---	---
Off	Off	Off	On	Off	1080p/24	1080p/24sF	625i/48	625i/48	NTSC	Clock	---
On	Off	Off	On	Off	1080p/23.98	1080p/23.98sF	625i/47.96	625i/47.96	NTSC	Clock	---
Off	On	Off	On	Off	1080p/24sF	1080p/24sF	625i/48	625i/48	NTSC	Clock	---
On	On	Off	On	Off	1080p/23.98sF	1080p/23.98sF	625i/47.96	625i/47.96	NTSC	Clock	---
Off	Off	On	On	Off	720p/60	1080p/24sF	625i/48	6Hz Pulse	NTSC	Clock	---
On	Off	On	On	Off	720p/59.94	1080p/23.98sF	625i/47.96	6Hz Pulse	NTSC	Phase	1
Off	On	On	On	Off	1035i/60	1080p/24sF	625i/48	6Hz Pulse	NTSC	Clock	---
On	On	On	On	Off	1035i/59.94	1080p/23.98sF	625i/47.96	6Hz Pulse	NTSC	Phase	1
Off	Off	Off	Off	On	1080i/60	720p/60	525i/59.94	525i/59.94	NTSC	Clock	---
On	Off	Off	Off	On	1080i/59.94	720p/59.94	525i/59.94	525i/59.94	NTSC	Phase	1,2,3,4
Off	On	Off	Off	On	60 V drive	1080p/24sF	625i/48	6 Hz Pulse	NTSC	Clock	---
On	On	Off	Off	On	59.94 V drive	1080p/23.98sF	625i/47.96	6 Hz Pulse	NTSC	Phase	1

Table 2: Sync Output Selection Switch Settings

5.2. SELECTING THE GEN LOCK REFERENCE

The 7750SRG-HD will free run on its internal crystal oscillator or be referenced to a genlock signal applied to the GEN LOCK input. The genlock signal is a standard definition colour black video or 0.3 V bi-level sync. DIP switch 6 selects if the 7750TG-HD will free run or be referenced to the genlock Reference video as shown in Table 3.

DIP 6	FUNCTION	DESCRIPTION
Off	Free Run (default)	The 7750SRG-HD will free run on its internal crystal oscillator.
On	Gen Lock	The 7750SRG-HD sync outputs will be phase locked, or clock locked to a Standard Definition colour black video or bi-level sync signal as shown in Table 2.

Table 3: Gen Lock Reference Switch Settings

5.3. SETTING THE TIMING OF THE OUTPUTS WITH RESPECT TO THE GEN LOCK INPUT

DIP switch 7 selects if the 7750TG-HD will use the factory default phasing of its outputs to the reference genlock, or the user defined phase adjustments. Phasing of the outputs is only possible when the genlock lock is of the *phase* type as shown in Table 2. In most cases only the phase of output 1 is adjustable and the phase of the remainder of the outputs is locked to the phase of output 1. In the case where multiple outputs can be phased (as shown in Table 2) then the phase of each output can be adjusted independently. Figure 4 shows the default phase alignment of Output 1 to the genlock reference.

DIP 7	FUNCTION	DESCRIPTION

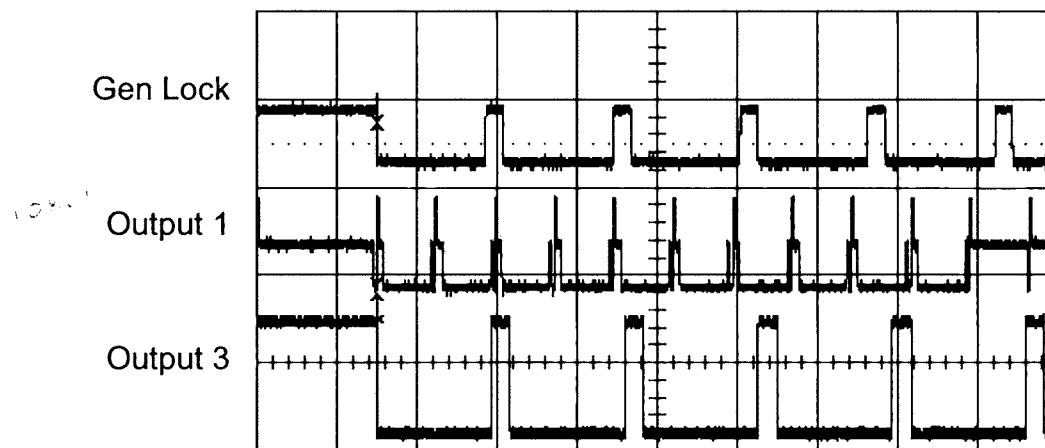| Off	Factory Phase (default)	The phase of the outputs is determined by factory settings when a genlock phase lock is possible (see Table 2)
On	User Preset Phase	The phase of the outputs is determined by user settings when a genlock phase lock is possible (see Table 2).

Table 4: Gen Lock Reference Switch Settings

Figure 3: Default Genlock Vertical Timing
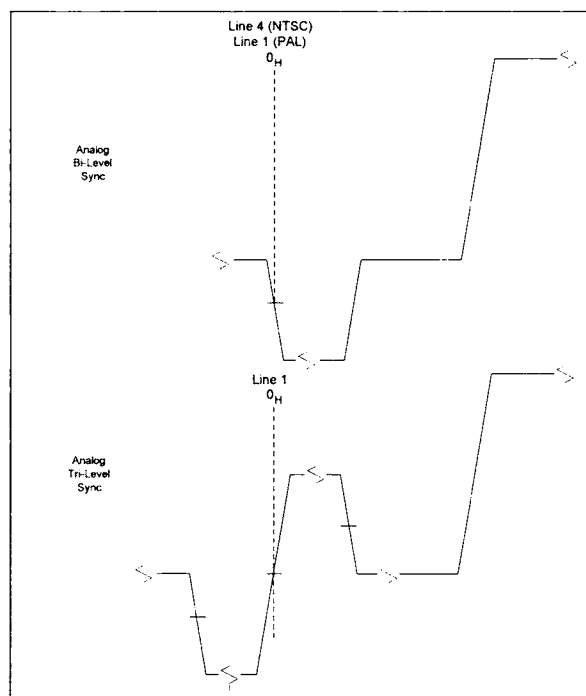
Figure 4: Default Genlock Horizontal Timing

5.3.1. Setting the Timing of the Output Video with Respect to the Gen Lock Input

The toggle switch and push button are used to set the timing of the output signals to the Gen Lock Reference. Individual V and H phase adjustments allow you to control the timing of the outputs with respect to the beginning of the Gen Lock reference frame. (0_H time of line 1 field 1 for PAL references or 0_H time of line 4 field 1 for NTSC References). The 0_H time of line 1 of output 1 is aligned to this point when the factory default phasing is used.

The V phase adjust provides a coarse adjustment of timing and sets the line number of the output video that will be aligned with beginning of the reference frame. The H phase adjust provides a fine adjust of timing and sets the pixel number of the line on the output video set by the V parameter that will be aligned with the beginning of the reference frame. If adjustments to the H parameter cause it roll through the pixel number at the start of a new line (the EAV) then the V parameter will change to the next higher or lower line. The factory default is to align the EAV of Line 1 of the output video with the beginning of the reference frame.

The three position, return to center toggle switch is used in conjunction with a momentary pushbutton to adjust the phase of the outputs with respect to the genlock reference. Four LEDs located on the lower end of the module (opposite the DIP switch) are used to indicate when the module is in phase adjust mode. The Output 1 Phase adjust LED is located closest to the center of the module. The LED will be On or flashing, indicating that you are adjusting the V or H phase of the specific output respectively.

To enter the phase adjust mode, press the pushbutton. The Output 1 Phase adjust Led will come on solid, indicating that the toggle switch can be used to adjust the V phase of output 1. Pressing the toggle switch up will advance the phase and pressing the toggle switch down will delay the phase. Press the pushbutton again to adjust the horizontal phase of output 1. The Output 1 Phase adjust Led will come on flashing, indicating that the toggle switch can be used to adjust the H phase of output 1. Pressing the toggle switch up will advance the phase and pressing the toggle switch down will delay the phase. Press the pushbutton again to adjust the phase of the next output, or to exit phase adjust mode if only one output can be phase adjusted.

6. JUMPERS
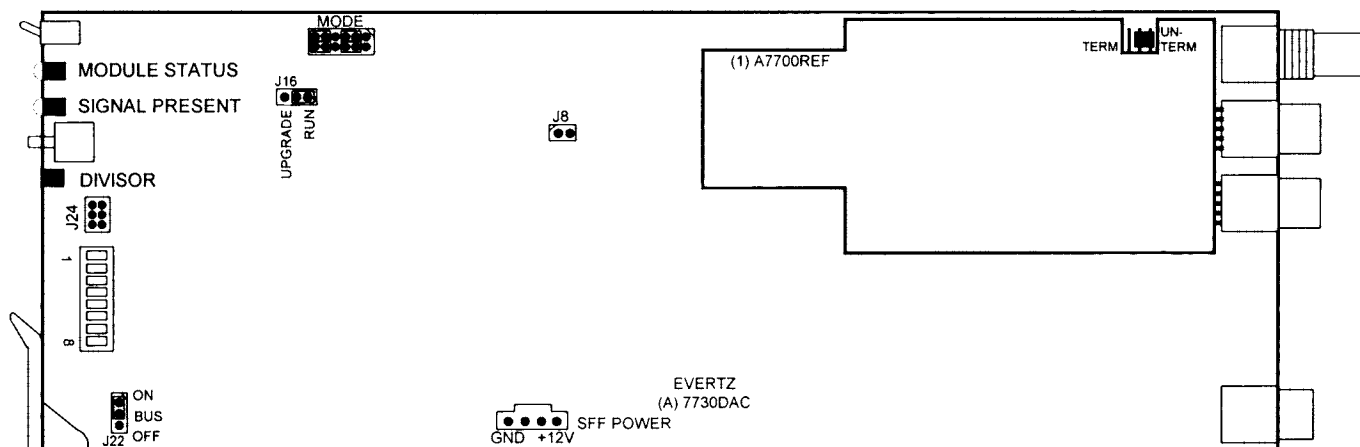
Figure 5 : Location of Jumpers

6.1. SELECTING WHETHER LOCAL FAULTS WILL BE MONITORED BY THE GLOBAL FRAME STATUS

BUS   The BUS jumper J22 located at the front of the module determines whether local faults (as shown by the Local Fault indicator) will be connected to the 7700FR frame's global status bus.

To monitor faults on this module with the frame status indicators (on the PS FRAME STATUS LED's and on the Frame's Fault Tally output) install this jumper in the On position. (Default)

When this jumper is installed in the Off position, local faults on this module will not be monitored.

6.2. CONFIGURING THE MODULE FOR FIRMWARE UPGRADES

UPGRADE   The UPGRADE jumper J16 located at near the top of the module near the MODE jumper block, is used when firmware upgrades are being done to the module. For normal operation it should be installed in the *RUN* position. See the *Upgrading Firmware* section of this manual for more information.

To upgrade the firmware in the module unit pull it out of the frame. Move Jumper J16 into the *UPGRADE* position. Install the Upgrade cable provided (located in the vinyl pouch in the front of this manual) onto header J24 at the card edge. Re-install the module into the frame. Run the upgrade as described in the *Upgrading Firmware* section of this manual. Once the upgrade is completed, remove the module from the frame, move J16 into the *RUN* position, remove the upgrade cable and re-install the module. The module is now ready for normal operation.

6.3. SELECTING WHETHER THE GENLOCK REFERENCE INPUT IS TERMINATED

TERM/UNTERM   The TERM/UNTERM jumper J2 located on the A7700REF gen lock sub-module is used to terminate the gen lock input. Then it is in the TERM position a 75 ohm terminating resistor will be connect the input to ground. When it is in the UNTERM position the gen lock input will be high impedance.

Figures

Tables

REVISION HISTORY

REVISION	DESCRIPTION	DATE
1.0	Original Version	Jan 00
1.1	Features added for software version 1.1 –Pulldown controlled by Ancillary Timecode if present –2.4:1 aspect ratio markers added –DIP switch and GPI reassignment for encoded Aspect ratio marker control	Mar 00
1.2	Features added for software version 1.3 –GPI5 autosenses one of two functions – 6Hz Pulse or Pulldown Disable Closure –Frame marked by 6 Hz pulse on GPI5, RP188 or Film ANC Timecode will become the A frame on the output –Phase of A frame Output aligned to frame following input A Frame candidate.	Oct 00

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1.   OVERVIEW

The 7732PFT-HD Progressive Format Translator converts 1.5 Gb/s HDTV video in the 1080p/24sF format to 1080i/60 digital video, thus allowing these signals to be viewed at a higher video refresh which eliminates the annoying 24 Hz flicker.   The 7732PFT-HD inserts extra fields to create a 3:2 pulldown of the picture content to increase the video frame rate from 24 to 30.

When an input video feed of 1080p/24sF is detected, a 3:2 pulldown of the picture is inserted resulting in a 1080i/60 output.   Determination of the output sequence of the fields is determined from a 6 Hz input pulse on GPI5, or from ancillary time code if it is present.   DIP switches allow the user to determine how the output pulldown aligns to the 6 Hz input or ancillary timecode. If an input video feed of 1080i/60 or any other format is detected, it is simply passed through. When the 3:2 pulldown mode is turned off with a DIP switch or GPI input, the output video remains the same as the input video. An output tally indicates when the 3:2 pulldown mode is active and may be used to control external audio delay devices. Figure 1 shows the process of creating the 3:2 pulldown from the progressive video input with the DIP switches set to the default position.
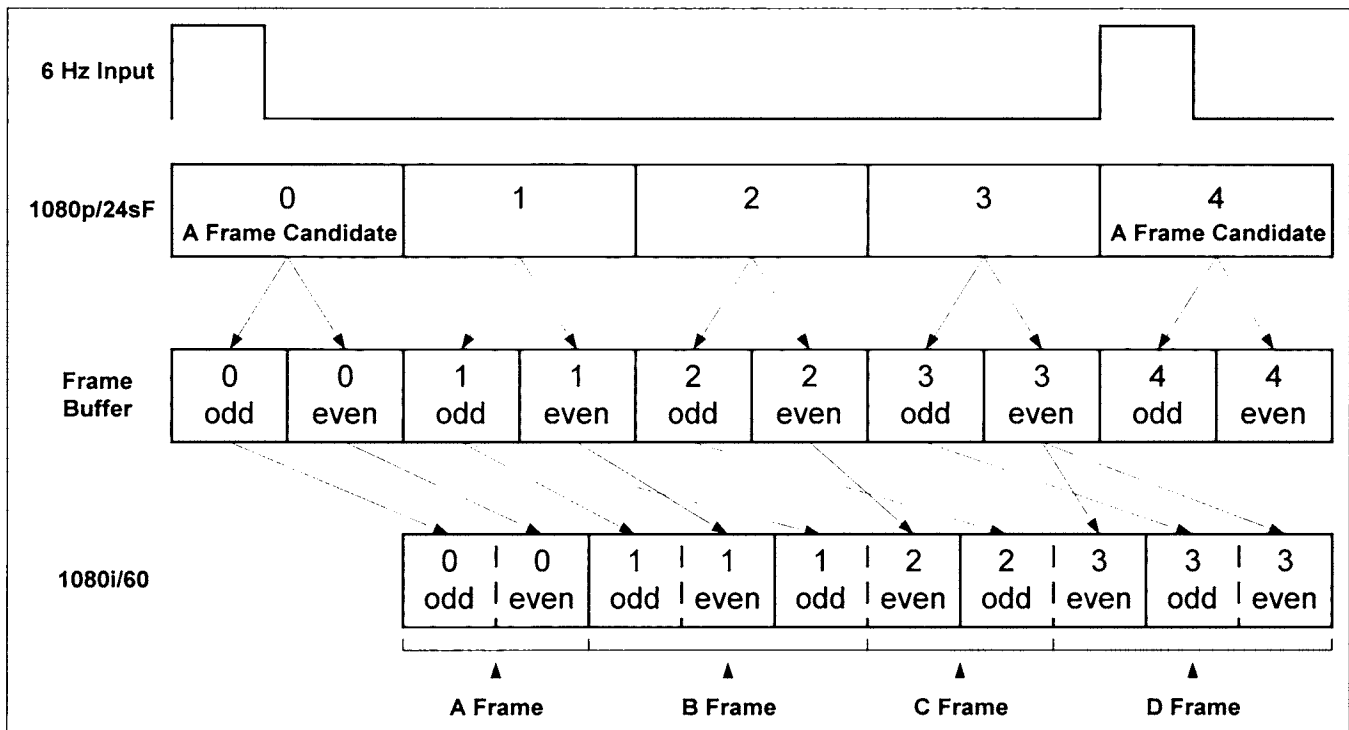
Figure 1: 3:2 Pulldown Creation

The user has the option of adding markers that show the extents of a 4:3 or 2.4:1 aspect ratio area in the center of the HD 16:9 image.
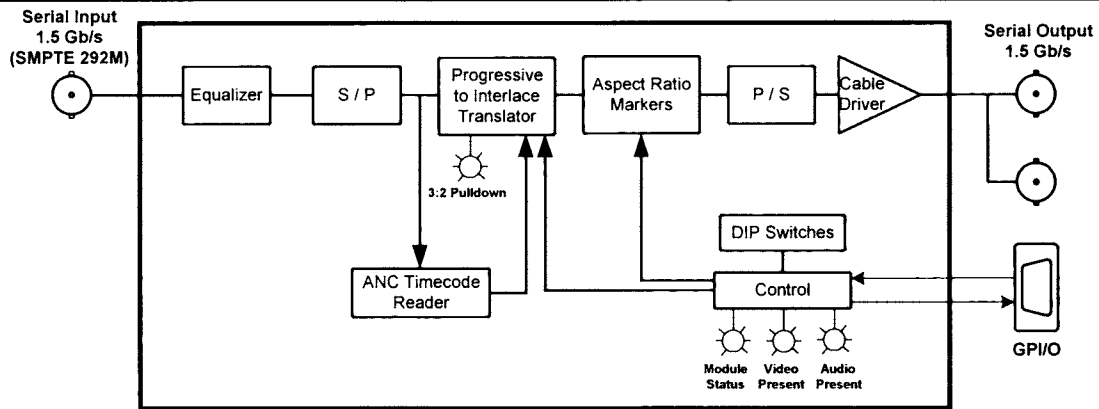
Figure 2: 7732PFT-HD Block Diagram

Features:

- Automatic detection of 1080p/24sF or 1080i/60 video input
- Pulldown of output set from 6 Hz pulse input or incoming ANC time code.
- DIP switch selection of A frame cadence
- Front panel LEDs indicate video signal presence, 3:2 pulldown insertion and module fault.
- 4:3 and 2.4:1 aspect ratio markers
- GPI Inputs control 3:2 pulldown and aspect ratio markers
- Tally output indicates 3:2 pulldown insertion active

2. INSTALLATION

The 7732PFT-HD module comes with a companion rear plate that has 3 BNC connectors and a female 15 pin high density D connector. For information on mounting the rear plate and inserting the module into the frame see section 3 of the 7700FR chapter.
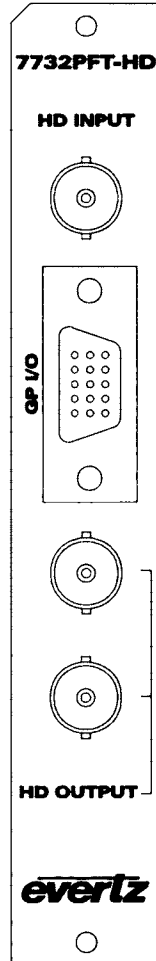
Figure 3: 7732PFT-HD Rear Panel

2.1. HD VIDEO INPUTS AND OUTPUTS

HD INPUT Input BNC connector for 10-bit serial digital video signals compatible with the SMPTE 292M standard.

HD OUTPUT There are two BNC connectors with reclocked serial component video outputs, compatible with the SMPTE 292M standard. When 3:2 Pulldown mode is active, these outputs contain the 1080p/24sF input video converted to 1080i/60. When 3:2 pulldown mode is not active the input video is passed through to the output.

2.2. GENERAL PURPOSE INPUTS AND OUTPUTS

The following is the pinout of the female HD DB-15 connector labeled **GPI/O**

DB-15	Name	Description
1	COMGND	RS 232 & GPI Ground
2	Tx	RS-232 TxD output (Future Use)
3	GPI 5	6 Hz Pulse & Pulldown Disable GPI Input
4		not used
5		not used
6	Rx	RS-232 RxD input (Future Use)
7	CTS	RS-232 CTS output (Future Use)
8	GPI 4	Aspect Ratio Markers GPI Input
9		not used
10	GP +5	General Purpose +5Volts Supply
11	RTS	RS-232 RTS input (Future Use)
12	GPI 6	Aspect Ratio Markers GPI Input
13	GPO 7	Pulldown Mode Active Tally Output
14		not used
15	Vext	Ext. Voltage Input to GPIO Circuitry

Table 1: GPI/O DB 15 Connector Pinout

Figure 4 shows a schematic diagram of the GPIO circuitry. The user can connect GP+5V supplied from the frame into the Vext pin to provide power to the GPIO opto-isolator circuitry. In this configuration the user can activate GPIs simply by connecting the GPI input pins to Ground (see Figure 5). This can be done with a button, switch, relay or an open collector transistor. In this configuration the GPOs will be internally pulled up to 5 volts. (See Figure 7) Five volts is available to the user to be used for driving external circuitry. Care must be taken to limit the load to 0.5W so there is no affect on the power supply source on the module.

Alternately, the user can connect an external power source for the opto-isolator circuitry. The Vext voltage must be greater than the voltage supplied to GPI by at least 5v. Figure 6 and Figure 8 show how to wire the GPIs and GPOs from an external power supply.
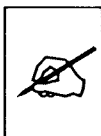
> **Warning: Do not connect GP+5V from one module to another module's GP+5V.**

The pulldown tally output is active low with an internal pull up (10k Ohm) resistor to the Vext pin. When active, the output will go low and is able to sink up to 10mA. When inactive, the signal will go high (to the voltage applied to the Vext pin). Do not attempt to source more than 100μA from the output.

The COM port signals are standard RS-232 with hardware flow control. The directions of the signals are indicated in the above table. The COM port is reserved for future use.
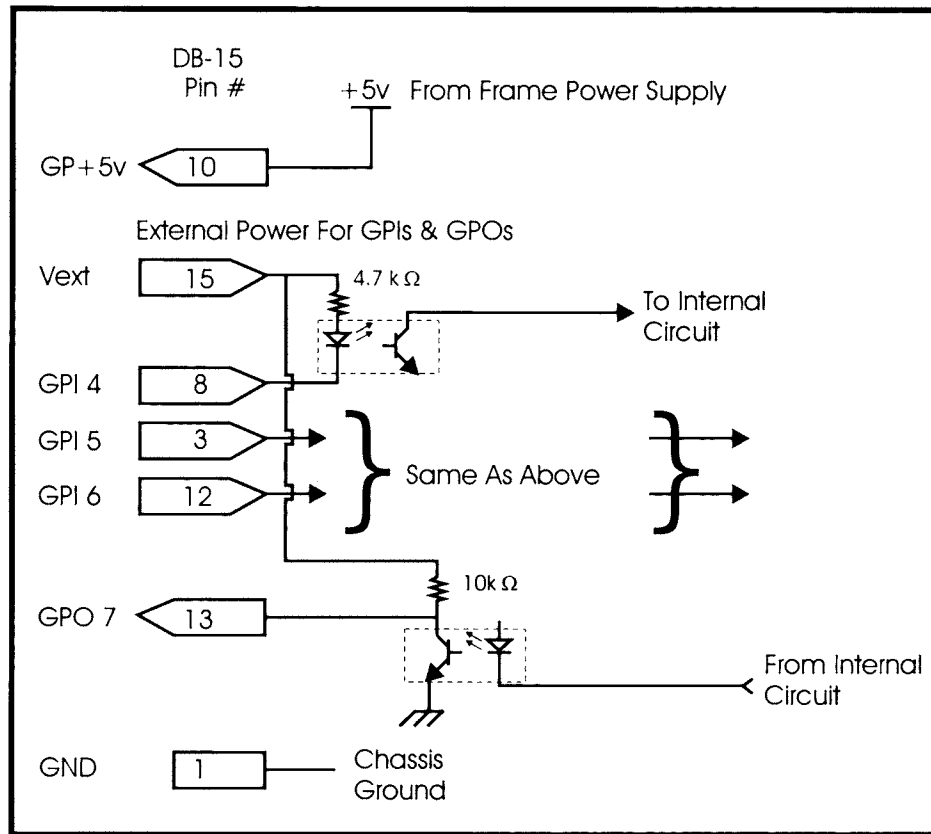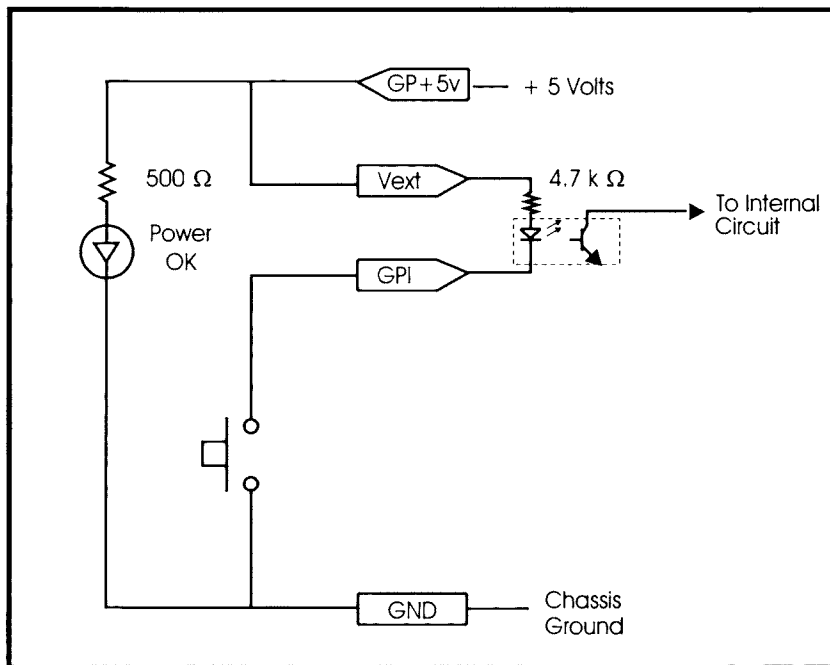
Figure 4: GPIO Opto Isolator Circuitry

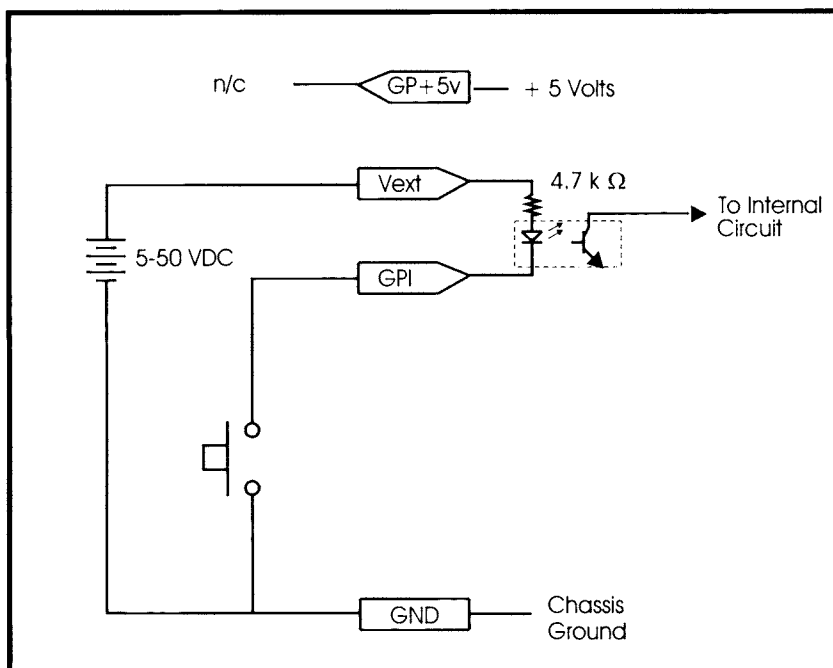**Figure 5: Powering the General Purpose Input Opto Isolators from the Module**

Figure 6: Powering the General Purpose Input Opto Isolators from an External Power Supply
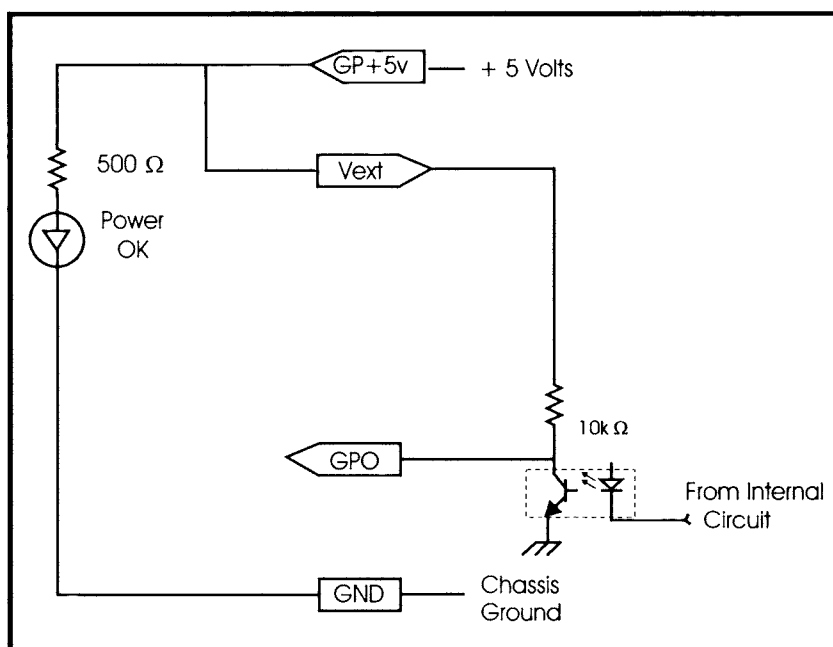

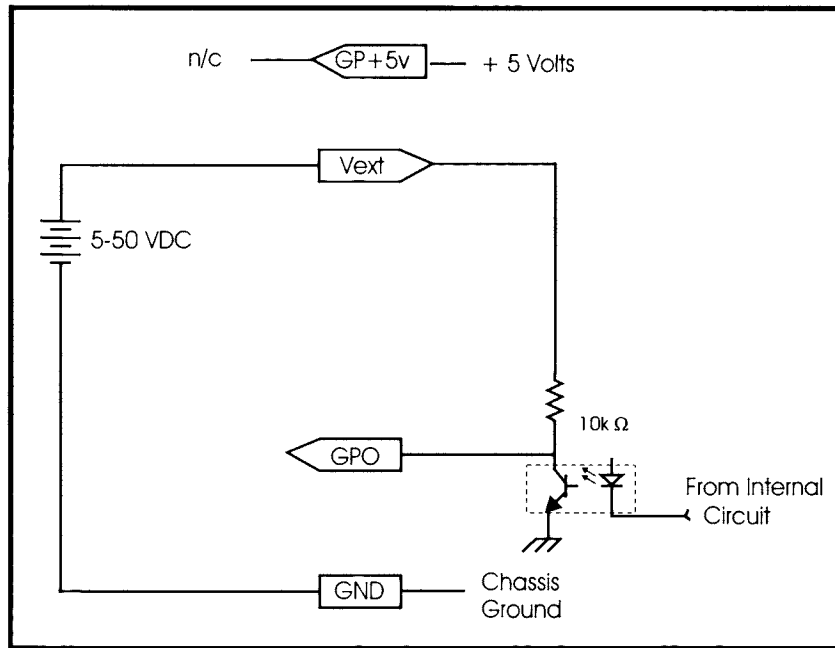**Figure 7: Powering the General Purpose Output Opto Isolators from the Module**

Figure 8: Powering the General Purpose Output Opto Isolators from an External Power Supply

3.   SPECIFICATIONS

3.1.   SERIAL VIDEO INPUT

Standard: 1.485 Gb/sec SMPTE 292M – 3:2 pulldown inserted with video standards shown in Table 2. Other video formats are passed through unchanged.

Connector: 1 BNC per IEC 169-8

Equalization: Automatic to 130m @ 1.5Gb/s with Belden 1694 or equivalent cable

Common Name	Pixels / Active Lines	Frame Rate	Progressive /Interlace	SMPTE Standard
1080p/24sF	1920 x 1080	24	P (sF)	RP211
1080p/23.98sF	1920 x 1080	23.98 (24/1.001)	P (sF)	RP211

Table 2: Video Input Formats

3.2.   HD SERIAL VIDEO OUTPUTS

Number of Outputs: 2
Connectors: BNC per IEC 169-8
Signal Level: 800mV nominal
DC Offset: 0V ±0.5V
Rise and Fall Time: 200ps nominal
Overshoot: <10% of amplitude
Wide Band Jitter: < 0.15 UI

3.3.   GENERAL PURPOSE IN/OUT

Inputs: GPI4 & GPI6: Activate Aspect Ratio Markers when pulled low
                        GPI5: Disable Pulldown mode when pulled low
                               Pulldown control input when 6 Hz pulse applied
Output: GPO7: Low when pulldown mode is active
Type: Opto-isolated, active low with internal pull-ups to Vext pin.
Connector: Female High Density DB-15
Signal Level: +5V nominal when Vext connected to + 5volt output

3.4.   ELECTRICAL

Voltage: + 12VDC
Power: 6 Watts.
EMI/RFI: Complies with FCC regulations for class A devices.
                        Complies with EU EMC directive.

3.5.   PHYSICAL

7700 or 7701 frame mounting:
   Number of slots: 1

Stand Alone Enclosure:
   Dimensions: 14 " L x 4.5 " W x 1.9 " H
                           (355 mm L x 114 mm W x 48 mm H)
   Weight: approx. 1.5 lbs. (0.7 Kg)

4.   STATUS LEDS

4.1.   MODULE STATUS LEDS

MODULE OK   This Green LED will be On when the module is operating properly

LOCAL FAULT   This Red LED makes it easy to identify one module in a frame that is missing an essential input or has another fault.

The LED will blink on and off if the microprocessor is not running.

The LED will be on solid when input video is missing or there is a fault in the module power supply.

VIDEO PRESENT   This Green LED will be On when there is a valid video signal present at the module input.

PULLDOWN   This Green LED will be On when 3:2 pulldown is being added to the input video.

AUDIO PRESENT   This Green LED is reserved for future use and will be always Off.

5.   CARD EDGE CONTROLS

The 7732PFT-HD is equipped with an 8 position DIP switch to allow the user to select various functions. All positions are assigned sequentially such that the DIP switch 1 is located at the top of the DIP switch (farthest from the card ejector). Table 3 gives an overview of the DIP switch functions. Sections 5.1 to 5.2 show the assigned DIP switch functions. The On position is down, or closest to the printed circuit board.

DIP Switch	Function
1	Reserved for future use
2	
3	Pulldown Disable Control
4	Aspect Ratio Marker Control
5	
6	ANC Timecode Selection
7	A Frame Alignment Control
8	

Table 3: DIP Switch Functions

5.2. CONTROLLING THE ASPECT RATIO MARKERS

DIP switches 4 and 5 control which one of the three aspect ratio markers will be enabled.

DIP 5	DIP 4	FUNCTION	DESCRIPTION
Off (default)	Off (default)	GPI4 & 6	Which markers will be On is determined by the GPI4 and GPI6 inputs – see Table 5.
Off	On	4:3 Prod	The 4:3 Production aperture markers will be On all the time. The 4:3 aspect ratio is measured with respect to production aperture and results in a set of vertical lines 1440 pixels apart.
On	Off	4:3 Clean	The 4:3 Clean aperture markers will be On all the time. The 4:3 aspect ratio is measured with respect to clean aperture and results in a set of vertical lines 1416 pixels apart.
On	On	2.4:1	The 2.4:1 aperture markers will be On all the time. The 2.4:1 aspect ratio is measured with respect to production aperture and results in a set of horizontal lines 800 lines apart.

Table 4: Aspect Ratio Marker Switch Settings

When DIP switches 4 and 5 are Off the GPI4 and GPI6 inputs determine which one of the aspect ratio markers is on.

GPI 6	GPI 4	FUNCTION	DESCRIPTION
High	High	Off	Aspect Ratio markers Off
High	Low	4:3 Prod	The 4:3 Production aperture markers will be On.
Low	High	4:3 Clean	The 4:3 Clean aperture markers will be On.
Low	Low	2.4:1	The 2.4:1 aperture markers will be On.

Table 5: Aspect Ratio Marker GPI Controls

5.3. CONTROLLING THE 3:2 PULLDOWN SEQUENCE

When an input video feed of 1080p/24sF is detected, the 7732PFT-HD inserts extra fields to create a 3:2 pulldown of the picture content to increase the video frame rate from 24 to 30. Determination of the output sequence of the fields is determined from a 6 Hz input pulse on GPI5, or from ancillary time code if it is present. The pulldown can also be disabled, resulting in the 1080p/24sF being clocked through to the output. Figure 1 shows how the extra fields are added to make the pulldown output.

5.3.1. Disabling the 3:2 Pulldown

GPI5 (pin 3 on the GPI/O connector) is a dual functioned input. When it is connected to a steady level (high or low) it acts as a pulldown disable control. When a 6 Hz pulse sequence is applied to the GPI5 pin, then the 6 Hz pulse will control the cadence of the pulldown output. DIP switch 3 provides a method of disabling the 3:2 pulldown on the output video from the card edge controls.

DIP 3	FUNCTION	DESCRIPTION
Off (default)	Use GPI5 Level Control	1080p/24sF input video will be converted to 1080i/60 when the GPI 5 input is open. 1080p/24sF input video will be passed through unchanged when the GPI 5 input is closed to ground. 1080i/60 and all other HD input video formats will always be passed through regardless of the GPI 5 input. When a 6 Hz pulse applied to GPI5, pulldown will be enabled.
On	Pulldown Disable	All input video formats will be passed through regardless of the GPI 5 input.

Table 6: 3:2 Pulldown Switch Settings

5.3.2. Controlling Where the 3:2 Pulldown A frame Occurs

The A frame of the pulldown sequence of the output video is set according to the following priority scheme.

1. 6 Hz pulse applied to the GPI5 input
2. RP188 ancillary timecode or the film ancillary data packet on the incoming video
3. If none of these are present, the pulldown sequence is established randomly at power up.

A 1/30th second wide active high pulse occurring 6 times per second applied to GPI5 will normally identify the input frame that will become an A frame at the output (called the *A frame candidate*). This 6 Hz pulse must be coincident with the start of an input frame and can be generated using the Evertz 7700SRG-HD Slave Reference Generator module. The output of the *A frame candidate* frame will start at the beginning of the next input frame and will consist of two video fields.

In the absence of a 6 Hz input video timecode derived from ancillary data present on the video input can be used to control the pulldown cadence. DIP switch 6 determines if the timecode will be derived from RP188 ANC timecode or the Film ancillary data packet (generated by the Evertz HD9025TR Film Footage Encoder). Input video frames with frame numbers divisible evenly by 4 will normally identify the input frame that will become an A frame at the output (the *A frame candidate*). The output of the *A frame candidate* frame will start at the beginning of the next input frame and will consist of two video fields.

DIP 6	FUNCTION	DESCRIPTION
Off (default)	RP188	Use RP188 ANC timecode to derive pulldown sequence if 6 Hz pulse missing.
On	Film ANC	Use Film ANC packet to derive pulldown sequence if 6 Hz pulse missing.

Table 7: Aspect Ratio Marker Intensity Switch Settings

DIP switches 7 and 8 allow the user to select other frames as the *A frame candidate*. Figure 9 shows how the DIP switches define the A frame when the 6 Hz pulse is present. Figure 10 shows how the DIP switches define the A frame when 6 Hz pulse is missing and the Ancillary data is used to control the 3:2 pulldown.
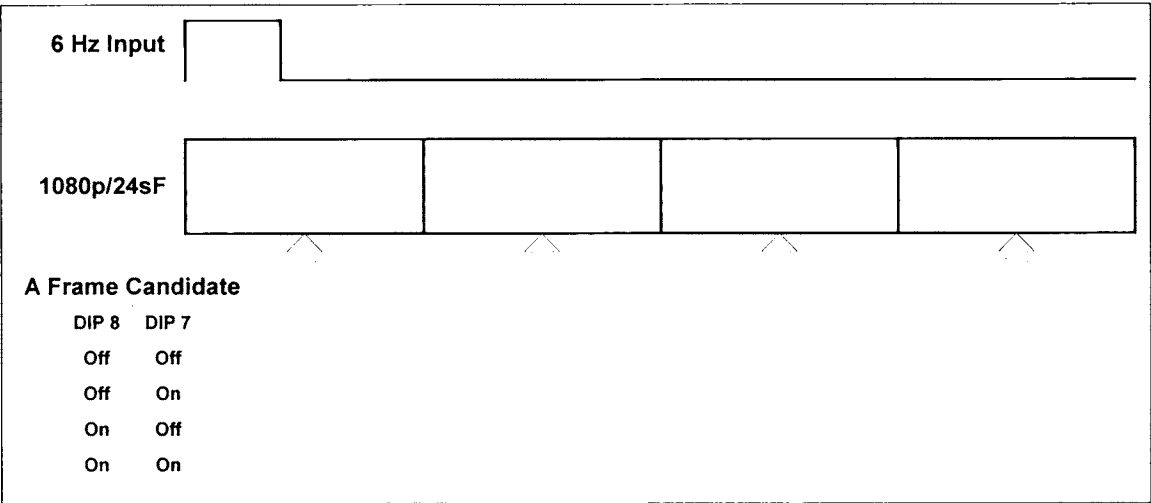
6 Hz Input

1080p/24sF

A Frame Candidate

DIP 8	DIP 7
Off	Off
Off	On
On	Off
On	On

Figure 9: 6 Hz Pulldown Sequence A Frame Alignment

1080p/24sF

:00	:01	:02	:03

A Frame Candidate

DIP 8	DIP 7
Off	Off
Off	On
On	Off
On	On
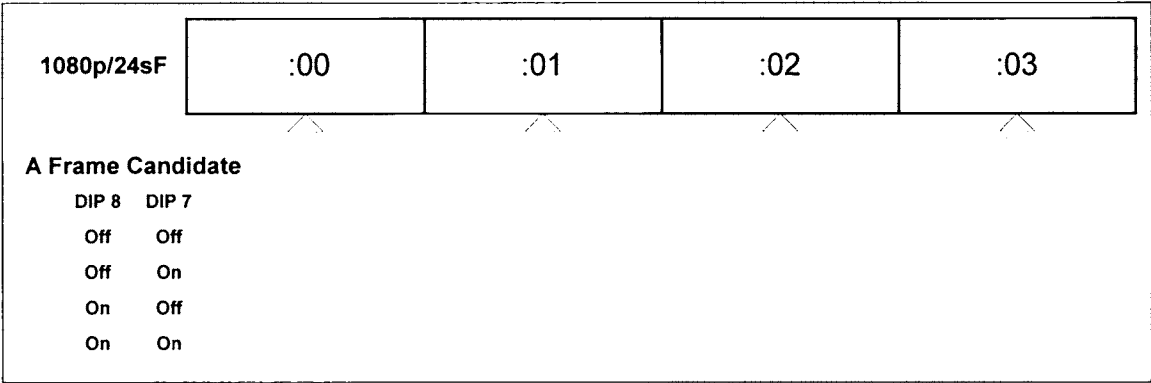
Figure 10: ANC Data Pulldown Sequence A Frame Alignment

6. JUMPERS

EVERTZ (A) 7700PB2

MODULE STATUS   J8

SIGNAL PRESENT

PULLDOWN

AUDIO Run

J24   J16

Upgrade

FRAME
STATUS   ON
             OFF
J22

SFF POWER GND +12V
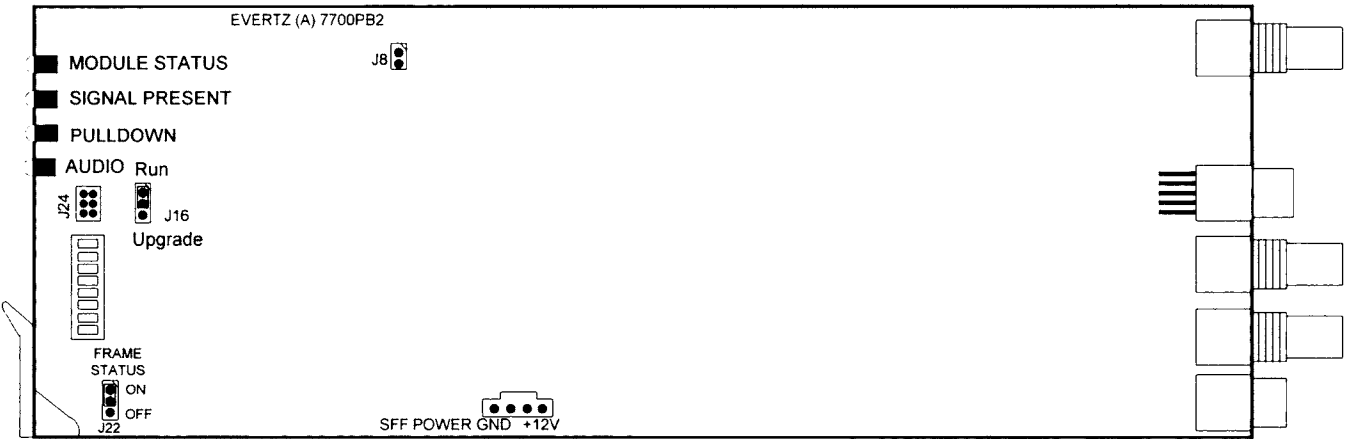
Figure 11 : Location of Jumpers on 7700PB2 Boards

6.1. SELECTING WHETHER LOCAL FAULTS WILL BE MONITORED BY THE GLOBAL FRAME STATUS

FRAME STATUS   The FRAME STATUS jumper located at the front of the module determines whether local faults (as shown by the Local Fault indicator) will be connected to the 7700FR frame's global status bus.

To monitor faults on this module with the frame status indicators (on the PS FRAME STATUS LED's and on the Frame's Fault Tally output) install this jumper in the On position. (Default) When this jumper is installed in the Off position, local faults on this module will not be monitored.

6.2. CONFIGURING THE MODULE FOR FIRMWARE UPGRADES

UPGRADE   The UPGRADE jumper J16 located at the front of the module is used when firmware upgrades are being done to the module. For normal operation it should be installed in the *RUN* position. See the *Upgrading Firmware* section of this manual for more information.

To upgrade the firmware in the module unit pull it out of the frame. Move Jumper J16 into the *UPGRADE* position. Install the Upgrade cable provided (located in the vinyl pouch in the front of this manual) onto header J24 at the card edge. Re-install the module into the frame. Run the upgrade as described in the *Upgrading Firmware* section of this manual. Once the upgrade is completed, remove the module from the frame, move J16 into the *RUN* position, remove the upgrade cable and re-install the module. The module is now ready for normal operation.

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Figures

Tables

REVISION HISTORY

REVISION	DESCRIPTION	DATE
0.1	Original Version - preliminary	June 99
0.2	Table of video formats expanded Block Diagram added Figure added showing card edge controls and jumper locations	Aug 99
0.3	On Screen Menu descriptions added	Oct 99
1.0	Genlock Reference info added, test signals updated	Nov 99
1.1	Updated DIP Switch information, added Clock locking function on genlock	Dec 99
1.2	Added new test signals as per firmware version 1.1 Build 81	Jan 00
1.3	Added new test signals as per firmware version 1.2 Build 12 Added On Screen Message menu support	Jun 00

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1. OVERVIEW

The 7750TG-HD Test Signal Generator provides a cost-effective method of generating 1.5 Gb/s HDTV test signals. The 7750TG-HD is ideal for checking signal path integrity, or to determine system performance over varying cable lengths. The 7750TG-HD generates test signals in a wide variety of SMPTE 292M video formats and offers four 1.5 Gb/s outputs.

The 7750TG-HD provides an analog genlock input that allows you to synchronize the test signals to your plant horizontal and vertical timing.

Separate audio tones can be embedded into each channel of one of the four embedded audio groups. The user can select which of the audio groups the tones will be embedded into.

Features:
- Wide variety of 1080i, 1035I, 1080p and 720p output formats
- 8 position DIP switch selects output format
- Card edge toggle switch selects test signal
- Selectable gen lock input format – bi-level or tri-level sync, colour black
- 4 embedded audio tones, selectable audio group assignment
- 4 output drivers
- On screen display of test signal names
- On screen setup menu
- Tally output upon loss of gen lock
- Front panel LEDs indicate gen lock presence, module fault and audio signal presence on the output
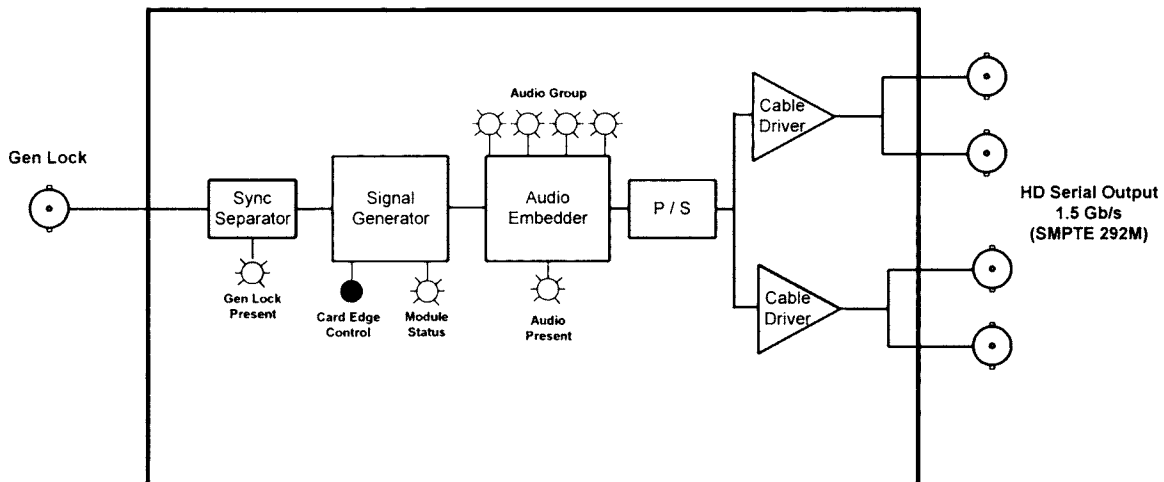

Figure 1: 7750TG-HD Block Diagram

2. INSTALLATION

The 7750TG-HD module comes with a companion rear plate that has 5 BNC connectors. For information on mounting the rear plate and inserting the module into the frame see the 7700FR chapter section 3.
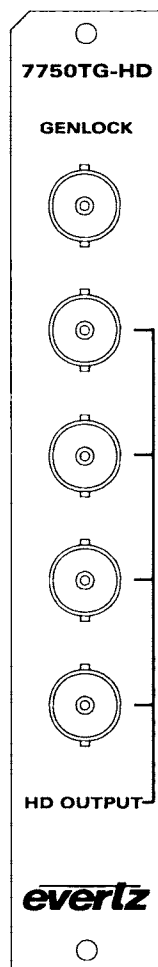

Figure 2: 7750TG-HD Rear Panel

GEN LOCK   Input BNC connector for analog Gen Lock reference. The genlock signal may be a HD tri-level sync or a standard definition colour black video or 0.3 V bi-level sync. DIP switches 6 and 7 used to configure the Genlock type. Table 3 gives a list of the valid reference signal types for the HD output video format you have selected. The *Reference Phase* On screen menu is used to set up the timing of the output signal with respect to the reference input. Jumper J2 on the A7700REF sub-module selects whether the reference input is terminated or high impedance. (See section 6.3)

HD OUTPUT There are four BNC connectors with serial component video outputs compatible with the SMPTE 292M standard. The output video format is selected using DIP switches 1 to 5. (See Table 3) The test signal output is selected using the toggle switch located on the card edge. The *Audio Setup* On screen menu is used to configure any embedded audio that will be present on the outputs.

3.   SPECIFICATIONS

3.1.   GEN LOCK INPUT

Type: DIP switch selectable - depends on output video format (see Table 3)
                 HD Tri-level Sync
                 NTSC or PAL Colour Black 1 V p-p
                 Composite Bi-level sync (525I or 625I) 300 mV
Connector: 1 BNC per IEC 169-8
Termination: 75 ohm (jumper selectable)

3.2.   HD SERIAL VIDEO OUTPUTS

Number of Outputs: 4.
Standard: SMPTE 292M, Selectable as per Table 3
Embedded Audio: Up to 4 tones in one audio group as specified in SMPTE 299M. Selectable tone
                     frequencies (from 60 Hz to 10 kHz) and audio group
Connectors: 4 BNC per IEC 169-8
Signal Level: 800mV nominal
DC Offset: 0V ±0.5V
Rise and Fall Time: 200ps nominal
Overshoot: <10% of amplitude
Wide Band Jitter: < 0.15 UI

3.3.   ELECTRICAL

Voltage: + 12VDC
Power: 6 Watts.
EMI/RFI: Complies with FCC Part 15, class A and EU EMC directive.

4.   STATUS LEDS

4.1.   MODULE STATUS LEDS

The location of the status LEDs is shown in Figure 5.

MODULE OK   This Green LED will be On when the module is operating properly.

LOCAL FAULT   This Red LED will blink on and off if the microprocessor is not running. The LED
                   will be on solid when there is a fault in the module power supply.

SIGNAL PRESENT: This Green LED will be On when there is a valid genlock signal present at the
                   module genlock input.

> **This LED does not necessarily indicate that the genlock signal is the correct frame rate for the selected output video format. For example, if a 59.94 Hz signal is required for the selected output video format, but a 60 Hz signal is present at the genlock input, the SIGNAL PRESENT LED will be On. In this case the output video will NOT be properly referenced but will constantly try to re-sync to the genlock frame reference.**

AUDIO: This Green LED will be On when there is audio embedded into the outputs.

4.2. AUDIO GROUP STATUS LEDS

Four LEDs located on the lower end of the module (opposite the DIP switch) indicate the presence of embedded audio in the output video. The audio group LED 1 is located closest to the center of the module.

Audio Group LED	Color	Audio Group Status
1	Off	There is no group 1 audio on the video output.
	On	Group 1 audio is being embedded.
2	Off	There is no group 2 audio on the video output.
	On	Group 2 audio is being embedded.
3	Off	There is no group 3 audio on the video output.
	On	Group 3 audio is being embedded.
4	Off	There is no group 4 audio on the video output.
	On	Group 4 audio is being embedded.

Table 1: Audio Group Status LEDs

5. CARD EDGE CONTROLS

The 7750TG-HD is equipped with an 8 position DIP switch to allow the user to select various output video formats. A three position, return to center toggle switch is used to select the various test signal patterns and is also used in conjunction with a momentary pushbutton to operate the On screen Setup menu. Table 2 gives an overview of the DIP switch functions.

DIP Switch	Function
1	Video Output Format Selection
2	
3	
4	
5	
6	Gen Lock Format Selection
7	
8	

Table 2: DIP Switch Functions

5.1.   SELECTING THE OUTPUT VIDEO FORMAT

DIP switches 1 to 5 are used to select the output video format of the 7750TG-HD. The On position is down, or closest to the printed circuit board. Table 3 shows the settings of the DIP switches for selecting the video output formats, and the types of genlock signals that can be used with each.

DIP Switch					Common Name	Pixels x Active Lines	Frame Rate	Progressive /Interlace	Valid Genlock Types	
1	2	3	4	5					Bi-Level (DIP 7 Off)	Tri-Level (DIP 7 On)
Off	Off	Off	Off	Off	1080i/60	1920 x 1080	30	I	525/60	1080i/60 1035i/60 1080p/30 1080p/30sF
On	Off	Off	Off	Off	1080i/59.94	1920 x 1080	29.97 (30/1.001)	I	525/59.94	1080i/59.94 1035i/59.94 1080p/29.97 1080p/29.97sF
Off	On	Off	Off	Off	1080i/50	1920 x 1080	25	I	625/50	1080i/50 1080p/25 1080p/25sF
On	On	Off	Off	Off	1080p/30	1920 x 1080	30	P	525/60	1080i/60 1035i/60 1080p/30 1080p/30sF
Off	Off	On	Off	Off	1080p/30sF	1920 x 1080	30	P (sF)	525/60	1080i/60 1035i/60 1080p/30 1080p/30sF
On	Off	On	Off	Off	1080p/29.97	1920 x 1080	29.97 (30/1.001)	P	525/59.94	1080i/59.94 1035i/59.94 1080p/29.97 1080p/29.97sF
Off	On	On	Off	Off	1080p/29.97sF	1920 x 1080	29.97 (30/1.001)	P (sF)	525/59.94	1080i/59.94 1035i/59.94 1080p/29.97 1080p/29.97sF
On	On	On	Off	Off	1080p/25	1920 x 1080	25	P	625/50	1080i/50 1080p/25 1080p/25sF
Off	Off	Off	On	Off	1080p/25sF	1920 x 1080	25	P (sF)	625/50	1080i/50 1080p/25 1080p/25sF
On	Off	Off	On	Off	1080p/24	1920 x 1080	24	P	625/48	1080p/24 1080p/24sF
Off	On	Off	On	Off	1080p/24sF	1920 x 1080	24	P (sF)	625/48	1080p/24 1080p/24sF
On	On	Off	On	Off	1080p/23.98	1920 x 1080	23.98 (24/1.001)	P	625/47.95	1080p/23.98 1080p/23.98sF
Off	Off	On	On	Off	1080p/23.98sF	1920 x 1080	23.98 (24/1.001)	P (sF)	625/47.95	1080p/23.98 1080p/23.98sF
On	Off	On	On	Off	720p/60	1280 x 720	60	P	525/60	720p/60
Off	On	On	On	Off	720p/59.94	1280 x 720	59.94 (60/1.001)	P	525/59.94	720p/59.94
On	On	On	On	Off	1035i/60	1920 x 1035	30	I	525/60	1080i/60 1080p/30 1080p/30sF 1035i/60
Off	Off	Off	Off	On	1035i/59.94	1920 x 1035	29.97 (30/1.001)	I	525/59.94	1080i/59.94 1080p/29.97 1080p/29.97sF 1035i/59.94

Table 3: Video Format DIP Switch Settings
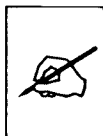
5.2.   SELECTING THE GEN LOCK REFERENCE TYPE

The 7750TG-HD can free run on its internal crystal oscillator or be referenced to a genlock signal applied to the GEN LOCK input. The genlock signal may be a HD tri-level sync or a standard definition colour black video or 0.3 V bi-level sync. DIP switches 6, 7 and 8 used to configure the genlock type. Table 3 gives a list of the valid reference signal types for the HD output video format you have selected. DIP switch 6 selects if the 7750TG-HD will free run or be referenced to the genlock Reference video. DIP switch 7 selects the type of genlock reference being supplied. The *Reference Phase* On screen menu is used to set up the timing of the output signal with respect to the reference input. (See section 5.4.2) DIP switch 8 selects whether the genlock reference is used to phase the output video or just lock the clock rate.

DIP 8	DIP 7	DIP 6	Genlock Reference
Off	Off	Off	The 7750TG-HD will free run on its internal crystal oscillator.
Off	On	Off	
On	Off	Off	
On	On	Off	
Off	Off	On	The genlock reference signal is a Standard Definition colour black video or bi-level sync. The output video will be phase locked to the bi-level genlock reference. See Table 2 for reference types supported.
Off	On	On	The genlock reference signal is a High Definition tri-level sync. The output video will be phase locked to the Tri-Level genlock reference. See Table 2 for reference types supported.
On	Off	On	The genlock reference signal is NTSC colour black video. The output video will be phase locked to the NTSC genlock reference if possible (See Table 2 for output video formats that can be phase locked to NTSC). Other output video formats will be clock locked only.
On	On	On	Reserved, do not use.

Table 4: Gen Lock Reference Switch Settings

5.3.   SELECTING THE TEST SIGNAL

When the 7750TG-HD is not in the on screen setup menu, the toggle switch located on the front edge of the module is used to select test signal generated. Each time the toggle switch is pressed down the 7750TG-HD advances to the next test signal. Each time the toggle switch is pressed up the 7750TG-HD changes to the previous test signal. The name of the current test signal is shown momentarily on the lower left corner of the screen. Table 5 shows the test signals that are available. Most of the test signals are industry standard signals. Sections 5.3.1.1 to 5.3.1.3 describe the test signals that are unique to the 7750TG-HD.

> **Some test signals are not available on certain video formats.**

Test Signal Name		Test Signal Name
75% Color bars with pluge		60% Component Sweep (1-30 MHz) with 5 MHz Markers
100% Color bars with pluge		60% Component Sweep (15-30 MHz) with 2 MHz Markers
75% Color bars		60% Component Multiburst (1, 2, 4, 6, 8, 10 MHz)
100% Color bars		60% Component Multiburst (10, 12, 14, 16, 18, 20 MHz)
White Field		60% Component Multiburst (20, 22, 24, 26, 28, 30 MHz)
Black		100% Component Multiburst (1, 2, 4, 6, 8, 10 MHz)
Circle with Center Cross		100% Component Multiburst (10, 12, 14, 16, 18, 20 MHz)
Clean Aperture with Graticule		100% Component Multiburst (20, 22, 24, 26, 28, 30 MHz)
Clean Aperture with Center		Component Multipulse (5, 10, 15, 20, 25 MHz)
Clean Aperture		60% Y Line Sweep (1-30 MHz) with 5 MHz Markers
Production Aperture		60% Y Line Sweep (15-30 MHz) with 2 MHz Markers
Grey		60% Y Multiburst (1, 2, 4, 6, 8, 10 MHz)
Grey (all data bits active)		60% Y Multiburst (10, 12, 14, 16, 18, 20 MHz)
SDI Checkfield		60% Y Multiburst (20, 22, 24, 26, 28, 30 MHz)
Valid 5 Step		100% Y Multiburst (1, 2, 4, 6, 8, 10 MHz)
Field ID		100% Y Multiburst (10, 12, 14, 16, 18, 20 MHz)
Frame ID		100% Y Multiburst (20, 22, 24, 26, 28, 30 MHz)
5 Step Staircase		Y Multipulse (5, 10, 15, 20, 25 MHz)
Bowtie		100% White Window
75% Split field reverse bars with pluge		80% White Window
Valid Ramp		50% White Window
		20% White Window
		12% White Window

Table 5: Test Signal Selection

5.3.1. Description Of Unique Test Signals

This section describes features of some of the more unique test signals.

5.3.1.1. Clean Aperture with Graticule

This signal contains a number of key physical dimensions of the HDTV active picture area. It divides the 16x9 aspect ratio clean aperture area into an 8x6 graticule grid. The center 6x6 grid corresponds to a 4x3 aspect ratio rectangle that is concentric with the 16x9 clean aperture. The edges of the 4x3 area have different line patterns to help in identifying it. The clean aperture markers are placed so that the center of the lines is at the clean aperture. The production aperture markers are placed so that the outsides of the lines are at the production aperture (the extent of the total image). A center cross marker is also included to mark the middle of the image.

5.3.1.2. Production Aperture

Single horizontal lines and single pixel vertical borders around the active picture mark the production aperture. Single pixels and single horizontal lines are not legal for normal pictures but this test signal is designed to test equipment to make sure it is processing/passing the whole image area. If any side of the box is missing, then the device under test is not passing the whole production aperture.

5.3.1.3. The Grey Signals

These signals can be used as a 50% full field grey, and they are also designed to provide a best case and a worse case toggle rate on the test signal data bits. The regular *Grey* signal has both the luminance and the chrominance values set to 200hex, while the *Grey with all data bits active* signal has both the luminance and the chrominance bits alternating between 200hex and 1FFhex. The latter signal has every data bit toggling every video sample.

Most current digital logic designs use CMOS technology where the power consumed and the heat produced are proportional to the average toggle rate of all of the flip flops in the product. If a product performs a large amount of video processing (in proportion to all processing), and then there will be a power consumption difference between a "quiet" signal and a "very active" signal. The grey signals can be used as a best case and a worst case condition for checking such conditions.

5.4. CONFIGURING THE TEST GENERATOR USING THE ON SCREEN MENU

An On screen menu (OSD) is used to configure many of the test generator's parameters. The three position, return to center, **toggle switch** and momentary **pushbutton** located on the front edge of the module are used to navigate the OSD setup menus and configure the cards various controls.

To enter the OSD menu system, press the push button once. This will bring you to the main setup menu where you can use the **toggle switch** to move up and down the list of available sub menus. An arrow (>) moves up and down the left hand side of the menu items to indicate which item you are currently choosing. Once the arrow is on the desired item, press the **pushbutton** to select the next menu.

On all menus, there is a selectable item *Done*. Selecting *Done* will take you to the previous menu (the one that was used to get into the menu). If you are at the top level of the menu tree then selecting *Done* will exit the OSD menu and return the 7750TG-HD to the normal operating mode.

Once you are in a sub menu, there may be another menu level, or there may be a list of parameters to adjust. If there is another set of menu choices, use the toggle switch to select the next choice with the same procedure as in the main menu.

If there is a list of parameters to adjust, use the **toggle switch** to move up or down to the desired parameter and press the **pushbutton**. The arrow will move to the right hand side (<) indicating that you can now adjust the parameter. Using the toggle switch, adjust the parameter to its desired value. If the parameter is a numerical value, the number will increase if you lift the toggle switch and decrease if you push down on the toggle switch. If the parameter contains a list of choices, you can cycle through the list by pressing the toggle switch in either direction.

When you have stopped at the desired value, depress the **pushbutton**. This will update the parameter with the selected value and move the arrow back to the left side of the parameter list. Continue selecting and adjusting other parameters or use the *Done* commands to return to the next higher menu level.

5.4.1. Top Level Menu Structure

The following is a brief description of the top level of the menu tree that appears when you enter the On screen menu. Selecting one of these items will take you down into the next menu level.

Reference Phase	Sets the timing phase of the test signal to the Gen Lock reference input.
Audio Setup	Configure what audio tones will be embedded into the test signal, and which audio group will be used.
On Screen Message	Configure the On screen message.
Done	Exit On Screen Menu System

5.4.2. Setting the Timing of the Output Video with Respect to the Gen Lock Input

The *Reference Phase* menu is used to set the timing of the output video to the Gen Lock Reference. The V and H parameters allow you to control the timing of the output video with respect to the beginning of the frame on the Gen Lock reference input. An internally generated digital video sync structure, locked to analog genlock reference signal is used to genlock the 7750TG-HD test generator. The EAV of line 1 of this digital reference sync is the point to which all the Reference phasing adjustments are made. Figure 3 and Figure 4 show the relationship of the analog tri-level and bi-level inputs to the digital reference sync frame.

Figure 3: Tri-Level Reference Timing

Figure 4: Bi-Level Reference Timing

The V parameter provides a coarse adjustment of timing and sets the line number of the output video that will be aligned with beginning of the reference frame. The H parameter provides a fine adjust of timing and sets the pixel number of the line on the output video set by the V parameter that will be aligned with

the beginning of the reference frame. If adjustments to the H parameter cause it roll through the pixel number at the start of a new line (the EAV) then the V parameter will change to the next higher or lower line. The factory default is to align the EAV of Line 1 of the output video with the beginning of the reference frame.

5.4.3. Configuring 7750TG-HD Embedded Audio Parameters

The Audio Setup menu is used to select the audio group where embedded audio will be placed, and the frequency of the tones that will be put into each of the 4 embedded audio channels.

Group:	Selects the Audio Group where embedded audio will be placed.
Ch. 1:	Selects the audio signal for Audio Channel 1.
Ch. 2:	Selects the audio signal for Audio Channel 2.
Ch. 3:	Selects the audio signal for Audio Channel 3.
Ch. 4:	Selects the audio signal for Audio Channel 4.
Done	Return to main menu

5.4.3.1. Audio Group Selection

The *Group* parameter selects the Audio Group where embedded audio will be placed.

AUDIO		
	GROUP:	
	Off	No audio will be embedded in the video output.
	1, 2, 3, 4	Up to 4 groups of audio may be embedded in the output video. Audio will be embedded into the selected group. There are four green LED's under the DIP switches that indicate which of the four groups audio is being embedded into.

5.4.3.2. Audio Channel Selection

Each Audio Group has four audio channels. The *Ch 1, Ch 2, Ch 3,* and *Ch 4* parameters select the Audio signal that will be embedded into each of the 4 channels of the audio group selected by the *Audio Group* parameter.

AUDIO		
	Ch 1	
	Mute	Embedded audio in this channel will be silent.
	60 Hz 100 Hz 200 Hz 400 Hz 800 Hz 1.0 kHz 1.6 kHz 2.0 kHz 3.2 kHz 4.0 kHz 5.0 kHz 6.4 kHz 8.0 kHz 10 kHz	Selecting one of these signals will set the frequency of the tone that is embedded into this channel.

5.4.4. Configuring the On Screen Message Display

The 7750TG has a programmable 16-character text message that may be used to display a source identification message or any other information on the screen. The *On Screen Display* menu is used to enter the text message, to turn it on and off and set the position on the screen. The *On Screen Display* menu is also used to set the length of time that signal name display is on after the user changes the test signal.

Message Display	Turns the message display on and off.
Message	Edit the On screen message.
Set Message Position	Sets horizontal and vertical position of the message on the screen.
Signal Name Duration	Set the duration that the signal name display is on after test signal changes.
Done	Exit On Screen Menu System

5.4.4.1. Editing the On Screen Message Display

The *Message* submenu is used to edit the text message. When you enter the *message* submenu, the actual text message is displayed on the top line.

TEXT MESSAGE	Edit the message.
Clear	Clears the complete message to space characters
Justify	Used to move the message within the 16 char text message block
Done	Exit On Screen Display Menu System

To edit the message, press the pushbutton when the > indicator is on the left of the message. The ^ indicator will appear under the left character of the message. Use the toggle switch to change the character indicated by the ^ or press the pushbutton to advance to the next character. When you have finished editing the message the > will automatically appear to the left of the message. Use the toggle switch to select the *Clear*, *Justify* or *Done* menu items and press the pushbutton to exit the *Message* submenu.

5.4.4.2. Positioning the On Screen Message Display

The *Position Message* submenu is used to position the text message on the character raster. When you enter the *Position Message* submenu, a box the size of the maximum length message will appear on the screen. Use the toggle switch to move the box horizontally. When you press the pushbutton you will be able to move the box vertically on the screen using the toggle switch. Press the pushbutton quickly twice to exit the *Position Message* submenu.

Messages that are shorter than 16 characters can be moved within the 16-character text box using the *Justify* submenu item. This allows shorter messages to be positioned all the way to the left or right side of the screen

5.4.4.3. Setting the Display Time for the Signal Name Display

The *Signal Name Display* menu item is used to set the length of time the On screen signal name is displayed after the user selects a new signal. Use the toggle switch to select a duration in seconds. The Signal name display can also be turned permanently *On* or *Off*.

6. JUMPERS

Figure 5: Location of Jumpers

6.1. SELECTING WHETHER LOCAL FAULTS WILL BE MONITORED BY THE GLOBAL FRAME STATUS

FRAME STATUS   The FRAME STATUS jumper J22 located at the front of the module determines whether local faults (as shown by the Local Fault indicator) will be connected to the 7700FR frame's global status bus.

    To monitor faults on this module with the frame status indicators (on the PS FRAME STATUS LED's and on the Frame's Fault Tally output) install this jumper. (Default) When this jumper is removed, local faults on this module will not be monitored. For convenience you may re-install the jumper so that only one side is connected.

6.2. CONFIGURING THE MODULE FOR FIRMWARE UPGRADES

UPGRADE   The UPGRADE jumper J16 located at the front of the module is used when firmware upgrades are being done to the module. For normal operation it should be installed in the *RUN* position. On Rev 1 versions of this board the upgrade jumper is located in another location. See the *Upgrading Firmware* section of this manual for more information.

    To upgrade the firmware in the module unit pull it out of the frame. Move Jumper J16 into the *UPGRADE* position. Install the Upgrade cable provided (located in the vinyl pouch in the front of this manual) onto header J24 at the card edge. Re-install the module into the frame. Run the upgrade as described in the *Upgrading Firmware* section of this manual. Once the upgrade is completed, remove the module from the frame, move J16 into the *RUN* position, remove the upgrade cable and re-install the module. The module is now ready for normal operation.

6.3. SELECTING WHETHER THE GENLOCK REFERENCE INPUT IS TERMINATED

TERM/UNTERM   The TERM/UNTERM jumper J2 located on the A7700REF gen lock submodule is used to terminate the gen lock input. Then it is in the TERM position a 75 ohm terminating resistor will be connect the input to ground. When it is in the UNTERM position the gen lock input will be high impedance.

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Figures

Tables

REVISION HISTORY

REVISION	DESCRIPTION	DATE
0.1	Original Version - preliminary	Oct 00
1.0	Added Link Setup Menu items, general cleanup	Mar 01

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1. OVERVIEW

The 7750TG2-HD Test Signal Generator provides a cost-effective method of generating 1.5 Gb/s HDTV 4:2:2 and 4:4:4 test signals. The 7750TG2-HD is ideal for checking signal path integrity, or to determine system performance over varying cable lengths. The 7750TG2-HD generates test signals in a wide variety of SMPTE 292M video formats. In single link mode, the 7750TG2-HD outputs a 4:2:2 black signal on two outputs and the selected 4:2:2 test signal on the remaining two outputs. In dual link mode, the 7750TG2-HD outputs a 4:4:4 test signal on two dual-link 4:4:4 outputs.

The 7750TG2-HD provides an analog genlock input that allows you to synchronize the test signals to your plant horizontal and vertical timing.

Separate audio tones can be embedded into each channel of one of the four embedded audio groups. The user can select which of the audio groups the tones will be embedded into. In dual link mode, the selected audio groups will be embedded into each link.

Features:
- Wide variety of 1080i, 1035I, 1080p and 720p output formats
- 8 position DIP switch selects output format, single or dual link and genlock reference
- Card edge toggle switch selects test signal
- Selectable gen lock input format – bi-level or tri-level sync, colour black
- 4 embedded audio tones, selectable audio group assignment
- 4 output drivers
- On screen display of test signal names
- On screen setup menu
- Tally output upon loss of gen lock
- Front panel LEDs indicate gen lock presence, module fault and audio signal presence on the output
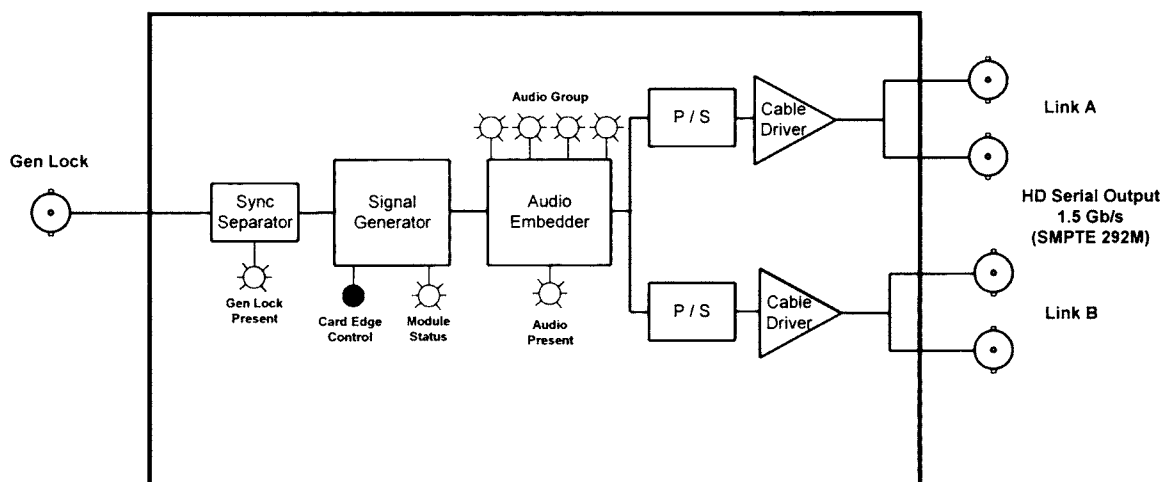

Figure 1: 7750TG2-HD Block Diagram

evertz

2. INSTALLATION

The 7750TG2-HD module comes with a companion rear plate that has 5 BNC connectors. For information on mounting the rear plate and inserting the module into the frame see the 7700FR chapter section 3.
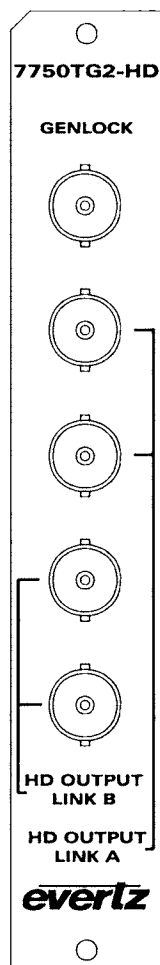

Figure 2: 7750TG2-HD Rear Panel

GEN LOCK   Input BNC connector for analog Gen Lock reference. The genlock signal may be a HD tri-level sync or a standard definition colour black video or 0.3 V bi-level sync. DIP switch 6 enables the Gen-Lock reference and the *Gen Lock Setup* on screen menu is used to configure the Genlock type and to set up the timing of the output signal with respect to the reference input. Table 3 gives a list of the valid reference signal types for the HD output video format you have selected. Jumper J2 on the A7700REF sub-module selects whether the reference input is terminated or high impedance. (See section 6.3)

HD OUTPUT LINK A This pair of BNC connectors has with serial component video outputs compatible with the SMPTE 292M standard. DIP switches 1 to 5 select the video standard. (See Table 3) When the 7750TG2-HD is operating the 4:2:2 mode these outputs contain the test signal. When the 7750TG2-HD is operating the 4:4:4 mode these outputs contain the 4:2:2 channel ($YC_{B(even)}C_{R(even)}$ or $GB_{(even)}R_{(even)}$) part of the test signal.

HD OUTPUT LINK B This pair of BNC connectors has with serial component video outputs compatible with the SMPTE 292M standard. DIP switches 1 to 5 select the video standard. (See Table 3) When the 7750TG2-HD is operating the 4:2:2 mode these outputs contain a black video signal. When the 7750TG2-HD is operating the 4:4:4 mode these outputs contain the Alpha channel ($AC_{B(ODD)}C_{R(odd)}$ or $AB_{(ODD)}R_{(odd)}$) part of the test signal.

The test signal output is selected using the toggle switch located on the card edge. The *Audio Setup* On screen menu is used to configure any embedded audio that will be present on the outputs.

3.   SPECIFICATIONS

3.1.   GEN LOCK INPUT

Type:	Menu selectable - depends on output video format (see Table 3)
	HD Tri-level Sync
	NTSC or PAL Colour Black 1 V p-p
	Composite Bi-level sync (525I or 625I) 300 mV
Connector:	1 BNC per IEC 169-8
Termination:	75 ohm (jumper selectable)

3.2.   HD SERIAL VIDEO OUTPUTS

Standard:	SMPTE 292M, 4:2:2 YC_BC_R, 4:4:4 YC_BC_R or 4:4:4 GBRA Selectable as per Table 3
Number of Outputs:	
Single Link Mode:	2 outputs of Black video
	2 outputs of selected test signal
Dual Link Mode:	2 dual link outputs of selected test signal.
Embedded Audio:	Up to 4 tones in one audio group as specified in SMPTE 299M. Selectable tone frequencies (from 60 Hz to 10 kHz) and audio group. Audio can be embedded on either or both links.
Source ID:	User programmable on-screen 15 character source ID message – selectable position. On Screen message can be displayed on either or both links.
Connectors:	4 BNC per IEC 169-8
Signal Level:	800mV nominal
DC Offset:	0V ±0.5V
Rise and Fall Time:	200ps nominal
Overshoot:	<10% of amplitude
Wide Band Jitter:	< 0.15 UI

3.3.   ELECTRICAL

Voltage:	+ 12VDC
Power:	6 Watts.
EMI/RFI:	Complies with FCC Part 15, class A and EU EMC directive.

3.4.   PHYSICAL

Number of slots: 1

4.   STATUS LEDS

4.1.   MODULE STATUS LEDS

The location of the status LEDs is shown in Figure 5.

MODULE OK   This Green LED will be On when the module is operating properly.

LOCAL FAULT   This Red LED will blink on and off if the microprocessor is not running. The LED
                       will be on solid when there is a fault in the module power supply.

SIGNAL PRESENT: This Green LED will be On when there is a valid genlock signal present at the
                       module genlock input.

> **This LED does not necessarily indicate that the genlock signal is the correct frame rate for the selected output video format. For example, if a 59.94 Hz signal is required for the selected output video format, but a 60 Hz signal is present at the genlock input, the SIGNAL PRESENT LED will be On. In this case the output video will NOT be properly referenced but will constantly try to resync to the genlock frame reference.**

AUDIO: This Green LED will be On when there is audio embedded into the outputs.

4.2.   AUDIO GROUP STATUS LEDS

Four LEDs located on the lower end of the module (opposite the DIP switch) indicate the presence of embedded audio in the output video. The audio group LED 1 is located closest to the center of the module.

Group LED	Color	Audio Group Status
1	Off	There is no group 1 audio on the video output.
	Green	Group 1 audio is being embedded.
2	Off	There is no group 2 audio on the video output.
	Green	Group 2 audio is being embedded.
3	Off	There is no group 3 audio on the video output.
	Green	Group 3 audio is being embedded.
4	Off	There is no group 4 audio on the video output.
	Green	Group 4 audio is being embedded.

Table 1: Audio Group Status LEDs

5. CARD EDGE CONTROLS

The 7750TG2-HD is equipped with an 8 position DIP switch to allow the user to select various output video formats. A three position, return to center toggle switch is used to select the various test signal patterns and is also used in conjunction with a momentary pushbutton to operate the On screen Setup menu. Table 2 gives an overview of the DIP switch functions.

DIP Switch	Function
1	Video Output Format Selection
2	
3	
4	
5	
6	Gen Lock Enable
7	Colour Space Selection
8	Dual Link Mode Enable

Table 2: DIP Switch Functions – Overview

5.1. SELECTING THE OUTPUT VIDEO FORMAT

DIP switches 1 to 5 are used to select the output video format of the 7750TG2-HD. The On position is down, or closest to the printed circuit board. Table 3 shows the settings of the DIP switches for selecting the video output formats, and the types of genlock signals that can be used with each.

DIP Switch					Common Name	Pixels x Active Lines	Frame Rate	Progressive /Interlace	Valid Genlock Types	
1	2	3	4	5					Bi-Level	Tri-Level
Off	Off	Off	Off	Off	1080i/60	1920 x 1080	30	I	525/60	1080i/60 1035i/60 1080p/30 1080p/30sF
On	Off	Off	Off	Off	1080i/59.94	1920 x 1080	29.97 (30/1.001)	I	525/59.94	1080i/59.94 1035i/59.94 1080p/29.97 1080p/29.97sF
Off	On	Off	Off	Off	1080i/50	1920 x 1080	25	I	625/50	1080i/50 1080p/25 1080p/25sF
On	On	Off	Off	Off	1080p/30	1920 x 1080	30	P	525/60	1080i/60 1035i/60 1080p/30 1080p/30sF
Off	Off	On	Off	Off	1080p/30sF	1920 x 1080	30	P (sF)	525/60	1080i/60 1035i/60 1080p/30 1080p/30sF
On	Off	On	Off	Off	1080p/29.97	1920 x 1080	29.97 (30/1.001)	P	525/59.94	1080i/59.94 1035i/59.94 1080p/29.97 1080p/29.97sF
Off	On	On	Off	Off	1080p/29.97sF	1920 x 1080	29.97 (30/1.001)	P (sF)	525/59.94	1080i/59.94 1035i/59.94 1080p/29.97 1080p/29.97sF
On	On	On	Off	Off	1080p/25	1920 x 1080	25	P	625/50	1080i/50 1080p/25 1080p/25sF
Off	Off	Off	On	Off	1080p/25sF	1920 x 1080	25	P (sF)	625/50	1080i/50 1080p/25 1080p/25sF
On	Off	Off	On	Off	1080p/24	1920 x 1080	24	P	625/48	1080p/24 1080p/24sF
Off	On	Off	On	Off	1080p/24sF	1920 x 1080	24	P (sF)	625/48	1080p/24 1080p/24sF
On	On	Off	On	Off	1080p/23.98	1920 x 1080	23.98 (24/1.001)	P	625/47.95	1080p/23.98 1080p/23.98sF
Off	Off	On	On	Off	1080p/23.98sF	1920 x 1080	23.98 (24/1.001)	P (sF)	625/47.95	1080p/23.98 1080p/23.98sF
On	Off	On	On	Off	720p/60	1280 x 720	60	P	525/60	720p/60
Off	On	On	On	Off	720p/59.94	1280 x 720	59.94 (60/1.001)	P	525/59.94	720p/59.94
On	On	On	On	Off	1035i/60	1920 x 1035	30	I	525/60	1080i/60 1080p/30 1080p/30sF 1035i/60
Off	Off	Off	Off	On	1035i/59.94	1920 x 1035	29.97 (30/1.001)	I	525/59.94	1080i/59.94 1080p/29.97 1080p/29.97sF 1035i/59.94

Table 3: Video Format DIP Switch Settings

5.2. SELECTING THE GEN LOCK REFERENCE TYPE

The 7750TG2-HD can free run on its internal crystal oscillator or be referenced to a genlock signal applied to the GEN LOCK input. The genlock signal may be a HD tri-level sync or a standard definition colour black video or 0.3 V bi-level sync. Table 3 gives a list of the valid reference signal types for the HD output video format you have selected. DIP switch 6 selects if the 7750TG2-HD will free run or be referenced to the genlock Reference video. The *Gen Lock* On screen menu is used to select the type of genlock reference being supplied, whether the genlock reference is used to phase the output video or just lock the clock rate. and to set up the timing of the output signal with respect to the reference input. (See section 5.6.2)

DIP 6	Genlock Reference
Off	The 7750TG2-HD will free run on its internal crystal oscillator.
On	The output video will be phase locked to the genlock reference if possible. See Table 2 for reference types supported.

Table 4: Gen Lock Reference Switch Settings

5.3. SELECTING THE COLOUR SPACE IN 4:4:4 MODE

DIP switch 7 is used to select whether the 7750TG2-HD generates 4:4:4 YC_BC_R or 4:4:4 GBRA video.

DIP 7	4:4:4 Colour Space
Off	The 7750TG2-HD will generate 4:4:4 YC_BC_R video
On	The 7750TG2-HD will generate 4:4:4 GBRA video

Table 5: 4:4:4 Colour Space Switch Settings

5.4. SELECTING THE OUTPUT MODE (4:2:2 OR 4:4:4)

DIP switch 8 is used to select whether the 7750TG2-HD generates 4:2:2 or 4:4:4 mode.

DIP 8	Output Mode
Off	The 7750TG2-HD will generate 4:2:2 video. The *Link A* output will contain the test signal and the *Link B* output will contain a black video signal.
On	The 7750TG2-HD will generate 4:4:4 video. The *Link A* output will contain the main channel ($YC_{B(even)}C_{R(even)}$ or $GB_{(even)}R_{(even)}$) part of the test signal. The *Link B* output will contain the Alpha channel ($YC_{B(odd)}C_{R(odd)}$ or $AB_{(ODD)}R_{(odd)}$) part of the test signal.

Table 6: Output Mode (4:2:2 or 4:4:4) Switch Settings

5.5.   SELECTING THE TEST SIGNAL

When the 7750TG2-HD is not in the on screen setup menu, the toggle switch located on the front edge of the module is used to select test signal generated. Each time the toggle switch is pressed down the 7750TG2-HD advances to the next test signal. Each time the toggle switch is pressed up the 7750TG2-HD changes to the previous test signal. The name of the current test signal is shown momentarily on the lower left corner of the screen. Table 7 shows the test signals that are available. Most of the test signals are industry standard signals. Sections 5.5.1.1 to 5.5.1.3 describe the test signals that are unique to the 7750TG2-HD.

> **Some test signals are not available on certain video formats.**

Test Signal Name	Test Signal Name
75% Color bars with pluge	60% Component Sweep (1-30 MHz) with 5 MHz Markers
100% Color bars with pluge	60% Component Sweep (15-30 MHz) with 2 MHz Markers
75% Color bars	60% Component Multiburst (1, 2, 4, 6, 8, 10 MHz)
100% Color bars	60% Component Multiburst (10, 12, 14, 16, 18, 20 MHz)
White Field	60% Component Multiburst (20, 22, 24, 26, 28, 30 MHz)
Black	100% Component Multiburst (1, 2, 4, 6, 8, 10 MHz)
Circle with Center Cross	100% Component Multiburst (10, 12, 14, 16, 18, 20 MHz)
Clean Aperture with Graticule	100% Component Multiburst (20, 22, 24, 26, 28, 30 MHz)
Clean Aperture with Center	Component Multipulse (5, 10, 15, 20, 25 MHz)
Clean Aperture	60% Y Line Sweep (1-30 MHz) with 5 MHz Markers
Production Aperture	60% Y Line Sweep (15-30 MHz) with 2 MHz Markers
Grey	60% Y Multiburst (1, 2, 4, 6, 8, 10 MHz)
Grey (all data bits active)	60% Y Multiburst (10, 12, 14, 16, 18, 20 MHz)
SDI Check field	60% Y Multiburst (20, 22, 24, 26, 28, 30 MHz)
Valid 5 Step	100% Y Multiburst (1, 2, 4, 6, 8, 10 MHz)
Field ID	100% Y Multiburst (10, 12, 14, 16, 18, 20 MHz)
Frame ID	100% Y Multiburst (20, 22, 24, 26, 28, 30 MHz)
5 Step Staircase	Y Multipulse (5, 10, 15, 20, 25 MHz)
Bowtie	100% White Window
75% Split field reverse bars with pluge	80% White Window
Valid Ramp	50% White Window
	20% White Window
	12% White Window

Table 7: Test Signal Selection

5.5.1. Description Of Unique Test Signals

This section describes features of some of the more unique test signals.

5.5.1.1. Clean Aperture with Graticule

This signal contains a number of key physical dimensions of the HDTV active picture area. It divides the 16x9 aspect ratio clean aperture area into an 8x6 graticule grid. The center 6x6 grid corresponds to a 4x3 aspect ratio rectangle that is concentric with the 16x9 clean aperture. The edges of the 4x3 area have different line patterns to help in identifying it. The clean aperture markers are placed so that the center of the lines is at the clean aperture. The production aperture markers are placed so that the outsides of the lines are at the production aperture (the extent of the total image). A center cross marker is also included to mark the middle of the image.

5.5.1.2. Production Aperture

Single horizontal lines and single pixel vertical borders around the active picture mark the production aperture. Single pixels and single horizontal lines are not legal for normal pictures but this test signal is designed to test equipment to make sure it is processing/passing the whole image area. If any side of the box is missing, then the device under test is not passing the whole production aperture.

5.5.1.3. The Grey Signals

These signals can be used as a 50% full field grey, and they are also designed to provide a best case and a worse case toggle rate on the test signal data bits. The regular *Grey* signal has both the luminance and the chrominance values set to 200hex, while the *Grey with all data bits active* signal has both the luminance and the chrominance bits alternating between 200hex and 1FFhex. The latter signal has every data bit toggling every video sample.

Most current digital logic designs use CMOS technology where the power consumed and the heat produced are proportional to the average toggle rate of all of the flip flops in the product. If a product performs a large amount of video processing (in proportion to all processing), and then there will be a power consumption difference between a "quiet" signal and a "very active" signal. The grey signals can be used as a best case and a worst case condition for checking such conditions.

5.6. CONFIGURING THE TEST GENERATOR USING THE ON SCREEN MENU

An On screen menu (OSD) is used to configure many of the test generator's parameters. The three position, return to center, **toggle switch** and momentary **pushbutton** located on the front edge of the module are used to navigate the OSD setup menus and configure the cards various controls.

To enter the OSD menu system, press the push button once. This will bring you to the main setup menu where you can use the **toggle switch** to move up and down the list of available sub menus. An arrow (>) moves up and down the left hand side of the menu items to indicate which item you are currently choosing. Once the arrow is on the desired item, press the **pushbutton** to select the next menu.

On all menus, there is a selectable item *Done*. Selecting *Done* will take you to the previous menu (the one that was used to get into the menu). If you are at the top level of the menu tree then selecting *Done* will exit the OSD menu and return the 7750TG2-HD to the normal operating mode.

Once you are in a sub menu, there may be another menu level, or there may be a list of parameters to adjust. If there is another set of menu choices, use the toggle switch to select the next choice with the same procedure as in the main menu.

If there is a list of parameters to adjust, use the **toggle switch** to move up or down to the desired parameter and press the **pushbutton**. The arrow will move to the right hand side (<) indicating that you can now adjust the parameter. Using the toggle switch, adjust the parameter to its desired value. If the parameter is a numerical value, the number will increase if you lift the toggle switch and decrease if you push down on the toggle switch. If the parameter contains a list of choices, you can cycle through the list by pressing the toggle switch in either direction.

When you have stopped at the desired value, depress the **pushbutton**. This will update the parameter with the selected value and move the arrow back to the left side of the parameter list. Continue selecting and adjusting other parameters or use the *Done* commands to return to the next higher menu level.

5.6.1. Top Level Menu Structure

The following is a brief description of the top level of the menu tree that appears when you enter the On screen menu. Selecting one of these items will take you down into the next menu level.

Gen Lock Setup	Configure the Gen Lock type and the timing phase of the test signal to the Gen Lock reference input.
Audio Setup	Configure what audio tones will be embedded into the test signal, and which audio group will be used.
OSD	Configure the On screen message.
Link Setup	Configure whether audio tones and On Screen Display messages will be inserted on Link A, Link B or Both.
Done	Exit On Screen Menu System

5.6.2. Configuring 7750TG2-HD Gen Lock Input

The Gen Lock Setup menu is used to select the Gen Lock type, to adjust the phase of the output video (with respect to the Gen Lock Input) and whether the output will be phase locked or clock locked to the Gen Lock input.

Ref Type	Selects whether the Gen Lock reference is bi-level or tri-level.
Lock Type	Selects whether the output will be clock or phase locked to the Gen Lock reference.
V Phase	Adjust the Vertical timing of the output
H Phase	Adjusts the horizontal timing of the output
Done	Return to main menu

5.6.2.1. Selecting the Gen Lock Input Type

The *Ref Type* parameter selects whether the 7750TG2-HD will accept a Bi-level or tri-level signal as the Gen Lock reference input.

GEN LOCK SETUP		
REF TYPE		
	Bi-Level	Gen Lock Reference is a NTSC or PAL standard definition colour black video or a 0.3 V bi-level sync.
	Tri-Level	Gen Lock Reference is a high definition tri-level sync.

5.6.2.2. Selecting How The Output Will Be Locked To The Gen Lock Input

The *Lock Type* parameter selects whether the 7750TG2-HD will be Phase or Clock locked to the Gen Lock Input. Normally it is desirable to phase lock the output signal to a house reference. This is only possible when the frame rate of the output matches the house frame rate. In situations when you need to provide an NTSC or 59.94 Tri-level sync reference, but you want to generate a 60.00 fps output (or another integer frame rate with a 1/1.001 frame rate gen-lock) select the clock lock mode. In this mode only the clock rate (and not the frame rate) of the output will be locked to the input.

GEN LOCK SETUP		
LOCK TYPE		
	Phase	Gen Lock Reference is a NTSC or PAL standard definition colour black video or a 0.3 V bi-level sync.
	Clock	Gen Lock Reference is a high definition tri-level sync.

5.6.2.3.   Setting the Timing of the Output Video with Respect to the Gen Lock Input

The *V Phase* and *H Phase* parameters allow you to control the timing of the output video with respect to the beginning of the frame on the Gen Lock reference input. Phasing of the output is only possible when the *Lock Type* parameter is set to *Phase* and the frame rate of the gen lock reference is the same as the frame rate of the output video format. An internally generated digital video sync structure, locked to the analog genlock reference signal (0_H time of line 1 field 1 for PAL or HD Tri-level references or 0_H time of line 4 field 1 for NTSC references) is used to genlock the 7750TG2-HD test generator. The EAV of line 1 of this digital reference sync is the point to which all the reference phasing adjustments are made. Figure 3 and Figure 4 show the relationship of the analog tri-level and bi-level inputs to the digital reference sync frame when the *V Phase* and *H Phase* parameters are set to zero.

Figure 3: Tri-Level Reference Timing

Figure 4: Bi-Level Reference Timing

The V parameter provides a coarse adjustment of timing and sets the line number of the output video that will be aligned with beginning of the reference frame. The H parameter provides a fine adjust of timing and sets the pixel number of the line on the output video set by the V parameter that will be aligned with the beginning of the reference frame. If adjustments to the H parameter cause it roll through the pixel number at the start of a new line (the EAV) then the V parameter will change to the next higher or lower line. The factory default is to align the EAV of Line 1 of the output video with the beginning of the reference frame.

5.6.3. Configuring 7750TG2-HD Embedded Audio Parameters

The Audio Setup menu is used to select the audio group where embedded audio will be placed, and the frequency of the tones that will be put into each of the 4 embedded audio channels.

Group:	Selects the Audio Group where embedded audio will be placed.
Ch. 1:	Selects the audio signal for Audio Channel 1.
Ch. 2:	Selects the audio signal for Audio Channel 2.
Ch. 3:	Selects the audio signal for Audio Channel 3.
Ch. 4:	Selects the audio signal for Audio Channel 4.
Done	Return to main menu

5.6.3.1.   Audio Group Selection

The *Group* parameter selects the Audio Group where embedded audio will be placed.

AUDIO		
GROUP:		
	Off	No audio will be embedded in the video output.
	1, 2, 3, 4	Up to 4 groups of audio may be embedded in the output video. Audio will be embedded into the selected group. There are four green LED's under the DIP switches that indicate which of the four groups audio is being embedded into.

5.6.3.2.   Audio Channel Selection

Each Audio Group has four audio channels. The *Ch 1, Ch 2, Ch 3,* and *Ch 4* parameters select the Audio signal that will be embedded into each of the 4 channels of the audio group selected by the *Audio Group* parameter.

AUDIO		
Ch 1		
	Mute	Embedded audio in this channel will be silent.
	60 Hz 100 Hz 200 Hz 400 Hz 800 Hz 1.0 kHz 1.6 kHz 2.0 kHz 3.2 kHz 4.0 kHz 5.0 kHz 6.4 kHz 8.0 kHz 10 kHz	Selecting one of these signals will set the frequency of the tone that is embedded into this channel.

5.6.4. Configuring the On Screen Message Display

The 7750TG has a programmable 16-character text message that may be used to display a source identification message or any other information on the screen. The *On Screen Display* menu is used to enter the text message, to turn it on and off and set the position on the screen. The *On Screen Display* menu is also used to set the length of time that signal name display is on after the user changes the test signal.

Message Display	Turns the message display on and off.
Message	Edit the On screen message.
Set Message Position	Sets horizontal and vertical position of the message on the screen.
Signal Name Duration	Set the duration that the signal name display is on after test signal changes.
Done	Exit On Screen Menu System

5.6.4.1. Editing the On Screen Message Display

The *Message* submenu is used to edit the text message. When you enter the *message* submenu, the actual text message is displayed on the top line.

TEXT MESSAGE	Edit the message.
Clear	Clears the complete message to space characters
Justify	Used to move the message within the 16 char text message block
Done	Exit On Screen Display Menu System

To edit the message, press the pushbutton when the > indicator is on the left of the message. The ^ indicator will appear under the left character of the message. Use the toggle switch to change the character indicated by the ^ or press the pushbutton to advance to the next character. When you have finished editing the message the > will automatically appear to the left of the message. Use the toggle switch to select the *Clear*, *Justify* or *Done* menu items and press the pushbutton to exit the *Message* submenu.

5.6.4.2. Positioning the On Screen Message Display

The *Position Message* submenu is used to position the text message on the character raster. When you enter the *Position Message* submenu, a box the size of the maximum length message will appear on the screen. Use the toggle switch to move the box horizontally. When you press the pushbutton you will be able to move the box vertically on the screen using the toggle switch. Press the pushbutton quickly twice to exit the *Position Message* submenu.

Messages that are shorter than 16 characters can be moved within the 16-character text box using the *Justify* submenu item. This allows shorter messages to be positioned all the way to the left or right side of the screen ·

5.6.4.3. Setting the Display Time for the Signal Name Display

The *Signal Name Display* menu item is used to set the length of time the On screen signal name is displayed after the user selects a new signal. Use the toggle switch to select a duration in seconds. The Signal name display can also be turned permanently *On* or *Off*.

5.6.5. Configuring the Link A and Link B Audio and On Screen Display

The Link Setup menu is used to select whether audio will be embedded on and whether the On Screen Display will be visible on Link A or Link B or both.

Audio	Selects whether the Audio is embedded on the Link A or Link B outputs or both.
OSD	Selects whether the On Screen Display items (setup menu, On Screen Message, test signal names, etc.) will be shown on the Link A or Link B outputs or both.
Done	Return to main menu

5.6.5.1. Selecting The Which Link Has Embedded Audio

The *Audio* parameter selects whether the 7750TG2-HD will embed the audio tones configured on the *Audio* Setup menu on the Link A or Link B outputs or both. See section 5.6.3 for information about selecting the audio groups and frequencies that will be embedded.

LINK SETUP			
	AUDIO		
		A	Audio Tones are embedded on Link A only.
		B	Audio Tones are embedded on Link B only.
		Both	Audio Tones are embedded on Link A and Link B.

5.6.5.2. Selecting The Which Link will Show the On Screen Display Items

The *OSD* parameter selects whether the 7750TG2-HD will display the On Screen Display Items (Test signal names, the Setup Menu itself and the On Screen message) configured on the *OSD* Setup menu on the Link A or Link B outputs or both. See section 5.6.4 for information about configuring the On Screen Message display.

LINK SETUP		
OSD		
	A	On Screen Display items are shown on Link A only. If you are currently viewing the On screen menu on one of the Link B outputs it will disappear when you select this menu choice.
	B	On Screen Display items are shown on Link B only. If you are currently viewing the On screen menu on one of the Link A outputs it will disappear when you select this menu choice.
	<u>Both</u>	On Screen Display items are shown on Link A and Link B

6. JUMPERS

Figure 5: Location of Jumpers

6.1. SELECTING WHETHER LOCAL FAULTS WILL BE MONITORED BY THE GLOBAL FRAME STATUS

FRAME STATUS The FRAME STATUS jumper J22 located at the front of the module determines whether local faults (as shown by the Local Fault indicator) will be connected to the 7700FR frame's global status bus.

To monitor faults on this module with the frame status indicators (on the PS FRAME STATUS LED's and on the Frame's Fault Tally output) install this jumper. (Default) When this jumper is removed, local faults on this module will not be monitored. For convenience you may re-install the jumper so that only one side is connected.

6.2. CONFIGURING THE MODULE FOR FIRMWARE UPGRADES

UPGRADE   The UPGRADE jumper J16 located at the front of the module is used when firmware upgrades are being done to the module. For normal operation it should be installed in the *RUN* position. On Rev 1 versions of this board the upgrade jumper is located in another location. See the *Upgrading Firmware* section of this manual for more information.

To upgrade the firmware in the module unit pull it out of the frame. Move Jumper J16 into the *UPGRADE* position. Install the Upgrade cable provided (located in the vinyl pouch in the front of this manual) onto header J24 at the card edge. Re-install the module into the frame. Run the upgrade as described in the *Upgrading Firmware* section of this manual. Once the upgrade is completed, remove the module from the frame, move J16 into the *RUN* position, remove the upgrade cable and re-install the module. The module is now ready for normal operation.

6.3. SELECTING WHETHER THE GENLOCK REFERENCE INPUT IS TERMINATED

TERM/UNTERM   The TERM/UNTERM jumper J2 located on the A7700REF gen lock submodule is used to terminate the gen lock input. Then it is in the TERM position a 75 ohm terminating resistor will be connect the input to ground. When it is in the UNTERM position the gen lock input will be high impedance.

TABLE OF CONTENTS

REVISION HISTORY

REVISION	DESCRIPTION	DATE
0.1	Preliminary Version	Feb 06
1.0	Released: Updated descriptions of Fill Input and added VistaLINK® screen shots	Jan 08
1.1	Updated section 5.5.25	Apr 08

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1. OVERVIEW

The 7725VBI-K-HD module is a multi-function VBI keyer. Every program input vertical interval video line can be programmed to pass upstream video, blank the line, insert any VBI line from the HD/SD Fill input, insert a selectable VITS (vertical interval test signal) for SD, and insert user selected data such as Wide Screen Signaling (WSS) and Active Format Description (AFD). The 7725VBI-K-HD allows for up to 70 lines to be programmed. The module provides the capability to store different VBI configurations as presets and recall them from the On-Screen Display (via Program Monitor Out), VistaLINK®, or via 8 opto-isolated GPI inputs.

The 7725VBI-K-HD has two re-clocked program outputs and one program monitor output. The module is often used in critical on-air applications and hence bypass relay protection of the program video path is provided. The 7725VBI-K-HD is setup via the On-Screen Display or VistaLINK®.

VistaLINK® enables remote monitoring, control and configuration capabilities via Simple Network Management Protocol (SNMP). This offers the flexibility to manage operations including signal monitoring and module configuration from SNMP enabled control systems (Manager or NMS) locally or remotely.

The 7725VBI-K-HD occupies one card slot in the 3RU 7700FR-C frame, which will hold up to 15 1-slot modules or the 1RU 7701FR frame, which will hold up to three 1-slot modules.

Features:
- One serial digital 1.5 Gb/s HD input per SMPTE 292M, or 270 Mb/s SD input per SMPTE 259M
- Two re-clocked HD or SD program outputs
- Video input relay bypass for power failure bypass protection
- One HD input or SD input digital Fill video input
- One HD or SD monitor program output with On-Screen Display
- A comprehensive on screen menu is available to configure the various features of the module
- 128 different presets for storing VBI keying configurations
- Up to 16 line patterns may be captured from any fill input line and stored in User Memories for later insertion on any VBI line
- Up to 70 lines of output video can be programmed
- Each line of VBI independently programmable to pass, blank, insert from fill signal, insert from user memory or insert factory test signals
- On-Air Preset configuration selected with GPI, OSD, or VistaLINK® selection
- Non-volatile memory protects current configuration in case of power loss
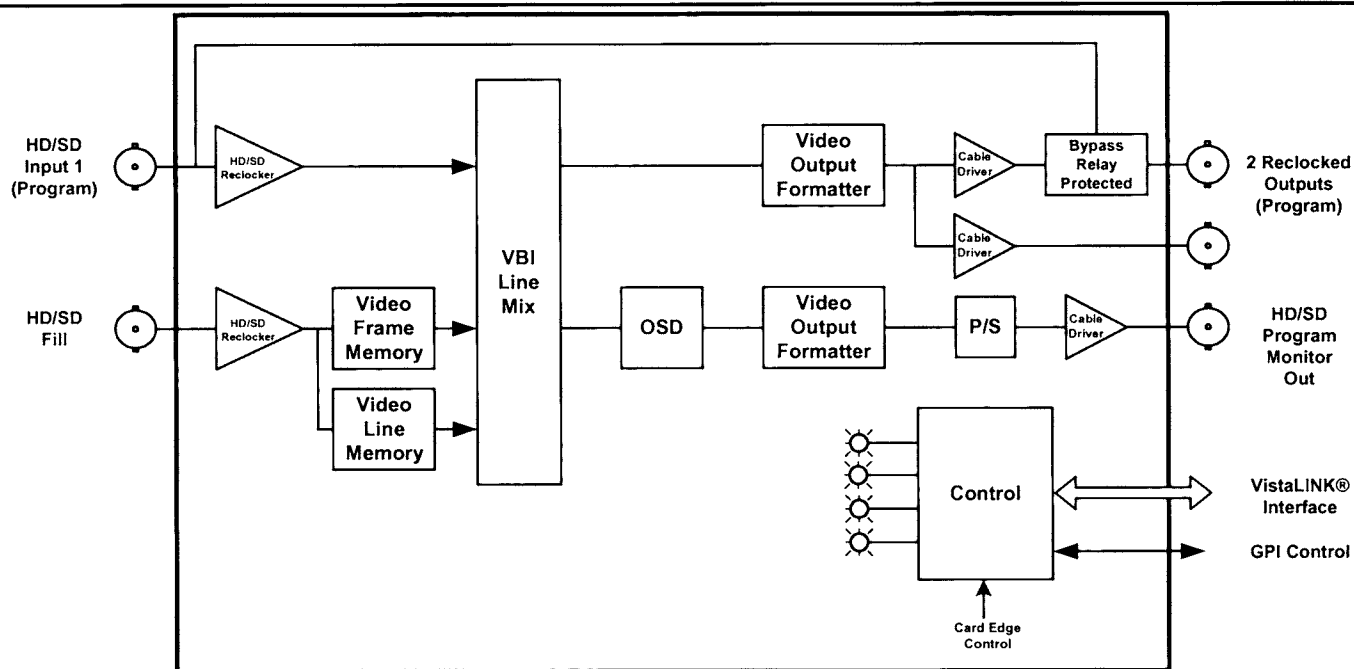- Fully hot-swappable from front of frame

Figure 1-1: 7725VBI-K-HD Block Diagram

The following sections outline several possible applications.

1.1. MASTER CONTROL OUTPUT CHAIN PROTECTION

Typically there are several units "chained" together on the output of a master control switcher. Units such as caption encoders, AMOL encoders, VITS inserters, data encoders, etc. are typically connected in a series in the program output so that if one unit fails the network output will fail. The 7725VBI-K-HD allows you to have one point of insertion in the program output path.
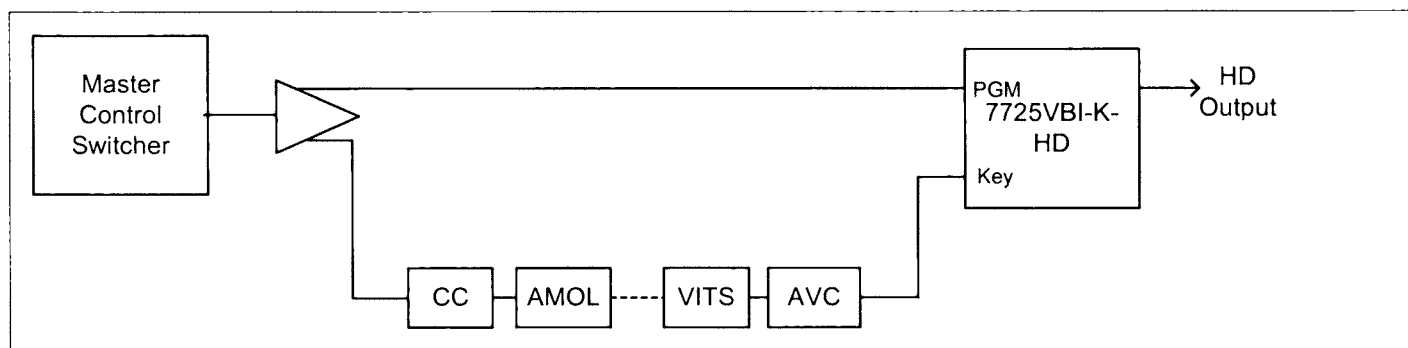

Figure 1-2: Master Control VBI Insertion Application

1.2. VANC BRIDGING

Some processing devices modify or destroy VBI data such as captioning or VITC. An example of this occurs with some DVE's during a squeeze back application or with HD colour correction. The 7725VBI-K-HD device will provide a bypass of VBI around the processing device.
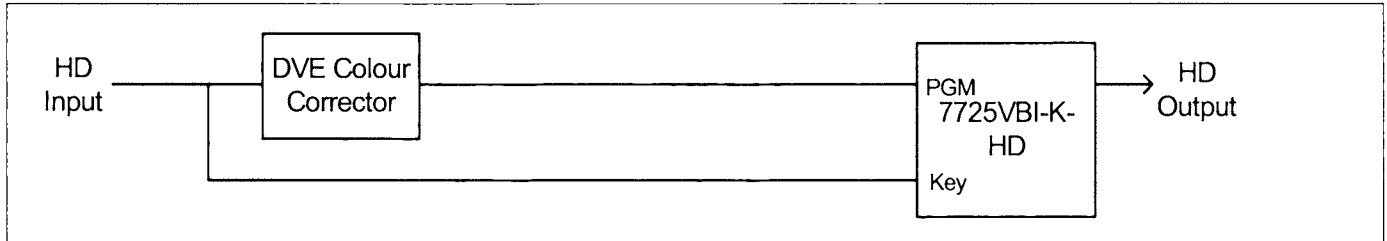

Figure 1-3: VANC Bridge Application

1.3. VBI LINE SHUFFLER

By providing the same feed to both inputs of the 7725VBI-K-HD, the unit will allow the user to modify the VBI and move lines as necessary.
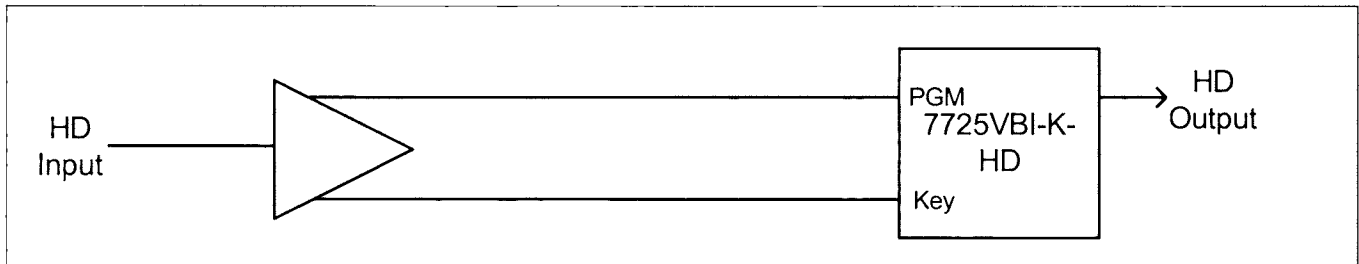

Figure 1-4: VBI Line Shuffle Application

2.   INSTALLATION

The 7725VBI-K-HD comes with a companion rear plate that has five BNC connectors and one 9 pin female D connector. Modules occupy one slot in the 7700FR-C frame. For more information on mounting the rear plate and inserting the module into the frame see section 3 of the 7700FR chapter.
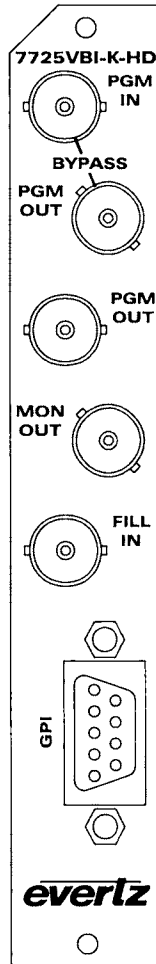

Figure 2-1: 7725VBI-K-HD Rear Panel

2.1.   VIDEO IN AND OUT

PGM IN: Input BNC connector for 10-bit serial digital signals compatible with the SMPTE 292M or SMPTE 259M-C standards. This BNC connector is used to supply the program video to the module.

FILL IN: Input BNC connector for 10-bit serial digital signals compatible with the SMPTE 292M or SMPTE 259M-C standards. This BNC connector is used to supply the signal that you want to insert into the VBI of the program video. This input will be referred to as the Fill input throughout this manual.

PGM OUT: There are two BNC connectors that contain the PGM input video with the VBI signals inserted. One of these outputs (marked as **BYPASS**) is protected by a bypass relay, which will activate in the event of power loss to the module.

MON OUT: This BNC connector contains the PGM input video with the VBI signals and is used for monitoring purposes. The HD/SD output is also used to display the On Screen Display.

2.2. GENERAL PURPOSE INPUTS

Table 2-1 shows the pinout of the 9 pin Female D GPI connector. The GPI inputs are active low. This means that if you leave an input floating (not connected) then it will not be activated. The user can activate GPIs simply by connecting the GPI input pins to Ground using a button, switch, relay or an open collector transistor. The inputs are internally pulled up to either +5 or +12 volts DC set by jumper J16.

Figure 2-2 shows the input circuit for the General Purpose inputs. The *GPI Mode* menu item is used to configure the operation of the GPI inputs. (See section 5.7)
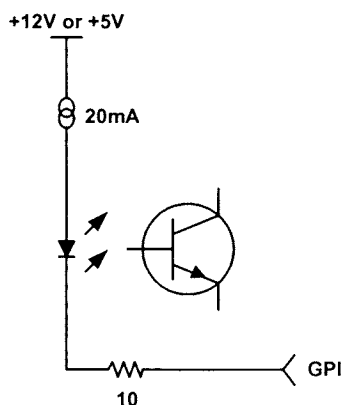

Figure 2-2: GPI Input Circuitry

DB-9	Name	Description
1	GPI8	General Purpose Input 8
2	GPI4	General Purpose Input 4
3	GND	Ground
4	GPI3	General Purpose Input 3
5	GPI2	General Purpose Input 2
6	GPI5	General Purpose Input 5
7	GPI6	General Purpose Input 6
8	GPI7	General Purpose Input 7
9	GPI1	General Purpose Input 1
Shell	Ground	Ground

Table 2-1: GPI Pinouts

3. SPECIFICATIONS

3.1. SERIAL VIDEO INPUT

Standard: Auto-detect
SMPTE 292M (1080i/59.94, 1080i/60, 1080i/50, 1080p/23.98, 1080p/23.98sF, 720p/59.94, 720p/60, and 720p/50)
SMPTE 259M-C (525i/59.94, 625i/50)
Number of Inputs: 1 for Program video (PGM)
1 for Fill Signal to insert (FILL)
PGM and FILL need to be synchronous and timed w.r.t. each other (+/- 1/2 line)
Connector: BNC input per IEC 60169-8 Amendment 2
Equalization: Automatic 125m @ 1.5 Gb/s with Belden 8281 or equivalent cable
Return Loss: > 14 dB (PGM input)

3.2. SERIAL VIDEO OUTPUTS

Number of Outputs: 3 (re-clocked for program, 1 bypass protection) same as input
1 (program monitor) same as input
Connector: BNC per IEC 60169-8 Amendment 2
Signal Level: 800mV nominal
DC Offset: 0V ±0.5V
Rise and Fall Time: 200ps nominal (HD)
Overshoot: <10% of amplitude
Wide Band Jitter: < 0.13UI
Return Loss: > 15 dB

3.3. GENERAL PURPOSE INPUTS

Number of Inputs: 8
Type: Opto-isolated, active low with internal pull-ups to +5 or +12V (jumper settable)
Connector: Female DB-9
Input signal: Closure to ground

3.4. ELECTRICAL

Voltage: +12VDC
Power: 10 Watts.
EMI/RFI: Complies with FCC regulations for class A devices.
Complies with EU EMC directive.

3.5. PHYSICAL

7700 or 7701 frame mounting:
    Number of slots: 1

4.   STATUS INDICATORS

4.1.   STATUS INDICATOR

The 7725VBI-K-HD has 11 LED status indicators on the front of the card edge to show operational status of the card at a glance. Figure 4-1 displays the location of the LEDs and card edge controls.
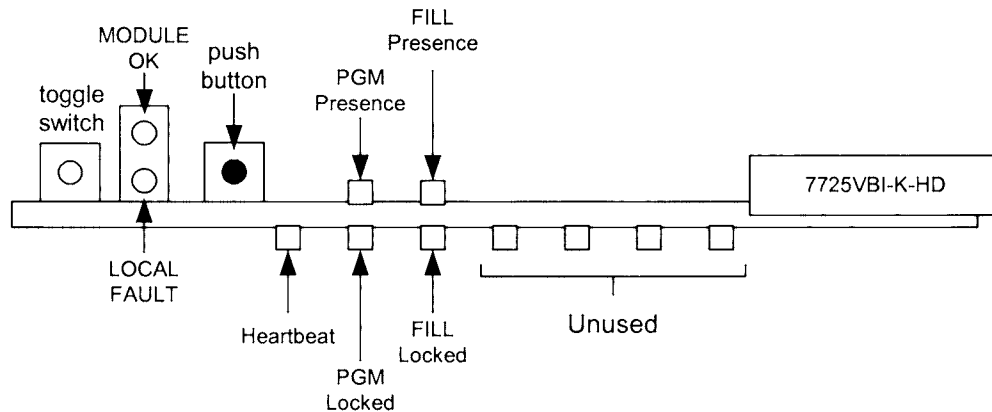

Figure 4-1: Status LED Locations

There are two large LEDs that indicate the general health of the module.

LOCAL FAULT: This Red LED indicates poor module health and will be On if a local input power fault exists (i.e.: a blown fuse) or if the module fails to boot (e.g.: upgrade jumper left on). The LOCAL FAULT indication can also be reported to the frame through the FRAME STATUS jumper.

MODULE OK: This Green LED indicates good module health. It will be On when the board power is good and the module has booted successfully.

The remaining LED status indicators are listed below:

HEARTBEAT (RUN): This Green LED will be blinking when the module is operating normally.

PGM PRESENCE: This Green LED indicates the presence of a signal on **PGM IN**.

PGM LOCKED: This Green LED indicates a valid standard on **PGM IN**.

FILL PRESENCE: This Green LED indicates the presence of a signal on **FILL IN**.

FILL LOCKED: This Green LED indicates a valid standard on **FILL IN**.

The other 4 LEDs near the card extractor are for future use.

4.2.   DIP SWITCHES

The 7725VBI-K-HD has a set of DIP switches accessible from the card edge. These are currently reserved for future use.

5.   ON SCREEN MENUS

5.1.   NAVIGATING THE ON SCREEN MENU SYSTEM

A toggle switch and pushbutton at the front card edge are used to navigate a set of on-screen menus, which are used to configure the card. To enter the on-screen menu system, press the pushbutton once. This will bring you to the main setup menu where you can use the toggle switch to move up and down the list of available sub-menus. An arrow (>) moves up and down the left hand side of the menu items to indicate which item you are currently choosing. There is also a line of text at the bottom of the screen to give instructions about the function of the menu item. Once the arrow is on the desired item, press the pushbutton to select the next menu level.

On all menus, there are two extra selectable items: *Back* and *Exit*. Selecting *Back* will take you to the previous menu (the one that was used to get into the current menu) while *Exit* will return the display to its normal operating mode. On the main menu, BACK and EXIT will both take you to the normal operating mode.

Once in a sub-menu, there may be another menu layer, or there may be a list of parameters to adjust. If there is another set of menu choices, use the toggle switch to select the desired menu item and press the pushbutton.

To adjust any parameter, use the toggle switch to move up or down to the desired parameter and press the pushbutton. The arrow will move to the right hand side of the line (<) indicating that you can now adjust the parameter. Using the toggle switch, adjust the parameter to its desired value. If the parameter is a numerical value, the number will increase if you lift the toggle switch and decrease if you push down on the toggle switch. If the parameter contains a list of choices, you can cycle through the list by pressing the toggle switch in either direction.

When you have stopped at the desired value, depress the pushbutton. This will update the parameter to the selected value and move the arrow back to the left side of the parameter list (>). Continue selecting and adjusting other parameters or use the *Back* or *Exit* commands.

Throughout the descriptions of the On Screen Menu items, default values are shown in underlined text.

5.2. ON SCREEN DISPLAY – MAIN MENU

Table 5-1 provides a brief description of the top level of the menu tree that appears when you enter the OSD menu. Selecting one of these items will take you down into the next menu level. Sections 5.3 to 5.8 provide detailed descriptions on each of the sub-menus.

Module Status	Shows the status of the module (input presence, video standard, etc.)
User Line Capture	Used to capture signals to the User Signal Memories
Edit Presets	Main configuration section used to configure each of the 128 Presets
Active Preset Number	Selects which preset is active
Preset GPI Mode	Configures the mode of the GPI
Utilities	Miscellaneous utilities such as firmware version, firmware upgrade, and clearing out the preset and user capture memories

Table 5-1: Menu Tree

5.3. DISPLAYING THE MODULE STATUS

The *Module Status* menu item is used to display the current status of the module. A screen with the following options will be displayed:

PGM Video	Displays the presence of input video
PGM Standard	Displays the detected standard (also operating standard of the module)
Fill Video	Displays the presence of input fill video
Fill Standard	Displays the detected standard of the fill video
Fill to PGM Delay	Displays the detected delay from the fill video to the PGM video
Preset Control	Displays if the preset is being set from GPI or manually from the menu
Active Preset	Displays the active preset number

Table 5-2: Module Status

5.4. CONFIGURING USER CAPTURE LINES

The 7725VBI-K-HD has the ability to capture up to 24 line patterns from any VBI line of the fill and store them in memory locations for later insertion on any VBI line of the program video. The *User Capture Line* menu is used to capture signals to the various user memories. Sections 5.4.1 to 5.4.3 gives detailed descriptions of the menu items.

Fill Video Line Number	Selects the line number of the fill video signal that will be captured.
Memory Destination Number	Selects the user memory location where the signal will be stored.
Start the Line Capture	Enables the line capture function.

5.4.1. Selecting the Fill Video Line Number

User Line Capture
Fill Video Line Number
1
1 to Max Line

Selects the line number of the fill input video that will be captured.

The range of lines is based on the video standard of the input Fill video signal that is applied to the module.

5.4.2. Selecting the Memory Destination for Capture Line

User Line Capture
Memory Destination Number
1
1 to 16

Selects the memory location to which the captured line from the fill input video is stored.

The memory location range is 1 to 16.

5.4.3. Capturing the Line from Fill Video Input

User Line Capture
Start the Line Capture
Cancel
Yes

This parameter will enable the line capture function.

When set to *Yes*, the 7725VBI-K-HD will begin to capture the line from the Fill input video. This operation MAY take a few seconds to complete. Once the operation is complete, the module will return to the *User Line Capture* menu.

When *Cancel* is selected, the capture function is not enabled and the user is returned to the *User Line Capture* menu.

The capture process MAY take a few seconds to complete.

5.5. CONFIGURING USER PRESETS

The 7725VBI-K-HD has 128 presets to store VBI Line Configuration. Each preset contains a complete set of (up to 70) VBI line signal settings. The *Edit Presets* menu is used to configure each of the preset memories. Sections 5.5.1 to 5.5.3 provides detailed descriptions of the menu items.

Edit Preset Number	Selects the preset that will store the configuration.
Edit Preset Configuration	Selects the desired processing for each VBI line of the preset
Display Preset Configuration	Provides a quick overview of the preset and shows the processing for all VBI lines.

5.5.1. Selecting the Preset Number to Edit or View

```
Edit Presets
   Edit Preset Number
      0
      0 to 127
```

Selects one of the 128 presets to edit or view the configuration.

The range of memory locations is 0 to 127.

5.5.2. Configuring the VBI Processing for a Preset

There are a number of parameters that can be configured for each preset. These parameters include: *Output Line*, *Line Source*, *Source Line Number*, and the *additional delay*. The user can configure up to 70 lines per preset. Sections 5.5.2.1 to 5.5.2.5 describe each parameter in further detail.

5.5.2.1. Selecting the VBI Line of the Program Output

```
Edit Presets
   Edit Presets Configuration
      Output Line Number
         1
         1 to 70
```

Selects a particular VBI line of the program output video. The permitted line numbers include lines for both field 1 and field 2 of the input video standard. The valid VBI lines are shown below:

	Field 1	Field 2
1080i	7-31, 554-563	570-594, 1114-1125
720p	7-56, 731-750	
NTSC	8-32, 254-263	271-295, 516-525
PAL	6-30, 303-312	319-343, 616-625

5.5.2.2. Selecting the Signal Source for a VBI Line

```
Edit Presets
  Edit Presets Configuration
    Line Source
      Program Video
      Fill Video
      User Line Capture
      Factory Line
      Blank Line
```

This control enables the user to select the source line that is to be keyed onto the selected VBI Line.

Selecting *Program Video* will pass the video through the program video unchanged.

Selecting *Fill Video* will insert a line from the Fill video over the program video. Select the specific line of the Fill video that you wish to insert using the *Source Line Number* menu item.

Select *User Line Capture* to insert a line from one of the User Memories over the program video. Select the specific User memory that is to be inserted using the *Source Line Number* menu item.

Select *Factory Line* to insert one of the factory supplied signals over the program video. Select the specific factory signal that is to be inserted using the *Source Line Number* menu item.

Select *Blank Line* to blank the selected line of the program video.

5.5.2.3. Selecting the Signal Line Number to Insert

```
Edit Presets
  Edit Presets Configuration
    Source Line Number
      1
      1 to Max
```

The function of this menu item depends on the setting of the *Line Source* menu item.

When *Line Source* is set to *Program Video*, this menu item does nothing. The module will simply pass the program video. The range of the parameter will depend on the input video standard.

When *Line Source* is set to *Fill Video*, this parameter selects a particular line of the fill video to insert. The permitted line numbers include lines for both field 1 and field 2 of the input video standard. The range of the parameter will depend on the input fill video standard.

When *Line Source* is set to *User Line Capture*, this parameter selects a captured line stored in one of the user memories for future insertion. The range of the parameter will be 1 to 16.

When *Line Source* is set to *Factory Line*, this parameter selects one of the factory supplied SD signals for future insertion. See Table 5-3 for a list of the Factory supplied test signals and their signal numbers.

5.5.2.4. Selecting the Amount of Delay to Add to the Source Line

| Edit Presets |
| Edit Presets Configuration |
| Add Frames of Delay |
| <u>0</u>   Set to 1 |
| 0 to 6 |

This menu item allows the user to add one or more frames of delay to the Fill Video line before it is inserted. This menu only has effect when the *Line Source* menu item is set to *Fill Video*.

5.5.2.5. Factory Supplied SD Test Signals

The following SD test signals are available within the 7725VBI-K-HD. For frame rates of 59.94Hz and 60Hz, NTSC test signals will be used. For frame rates of 50Hz, PAL test signals will be used.

	Name	Name
Number	**NTSC**	**PAL**
1	100% White	100% White
2	50% Gray	50% Gray
3	75% SMPTE Colourbars	CCIR Line 17
4	100% SMPTE Colourbars	CCIR Line 18
5	FCC Composite	CCIR Line 330
6	FCC Multiburst	CCIR Line 331
7	GCR System C	75% Colourbars
8	GCR Waveform	100% Colourbars
9	Linear 5 Step Staircase	GCR System C
10	Multiburst 100% / 4.2 MHz	Linear 5 Step Staircase
11	Multiburst 60% / 4.2 MHz	Multiburst 100% / 5.8 MHz
12	Modulated 5-Step Staircase	Multiburst 60% / 5.8 MHz
13	Modulated Ramp	Modulated Staircase
14	Multipulse 4.2 MHz	Pulse & Bar
15	NTC7 Combination	Modulated Ramp
16	NTC7 Composite	Ramp
17	Ramp	Shallow Ramp
18	Red Line	Sin (X)/X
19	Shallow Ramp	Sweep 60% to 5.5 MHz
20	Sin (X)/X 4.75 MHz	Sweep 100% t0 5.5 MHz
21	Sweep 60% / 4.2 MHz	Black
22	Sweep 60% / 5.5 MHz	Black
23	Valid Ramp	Black
24	VIRS	Black
25	75% Full Field Colourbars	Black
26	100% Full Field Colourbars	Black
27	Black	Black
28	Black	Black
29	Black	Black
30	Black	Black
31	Black	Black
32	Black	Black

Table 5-3: Factory Programmed SD Test Signals

5.5.3. Displaying Preset Configurations

The *Display Preset Configuration* under the *Edit Presets* menu allows the user to view the complete configuration for the preset number specified under section 5.5.1. The OSD will display the *Output Line Number*, *Video Line Number*, *Line Source*, *Source Line Number* and *Frames of Delay*.

5.6.   SELECTING AN ACTIVE PRESET

The 7725VBI-K-HD module has 128 memory locations to store user defined VBI Line Configuration presets. Each preset contains a complete set of VBI line signal settings.

Active Preset Number
GPI
GPI, 0 to 127

This menu item allows the user to determine the active preset or to configure the GPI inputs to recall the active preset.

When this menu item is set to one of the preset numbers, that preset will become active when you press the pushbutton.

When this menu item is set to *GPI*, then the GPI inputs will control which preset is active. The GPI inputs operate in one of two modes controlled by the *GPI Mode* menu item.

5.7.   CONFIGURING THE GPI MODE

Preset GPI Mode
One-Hot
Binary

The 7725VBI-K-HD has 8 GPI inputs that can be used to recall one of the presets remotely. This menu item is used to configure one of two GPI modes.

When this menu item is set to *One-Hot* the 8 GPI inputs will activate presets 1 to 8 respectively when they are closed to ground. Preset 0 will be selected when none of the GPIs are active

When this menu item is set to *Binary*, the GPI inputs 1 to 7 are binary encoded to select one of the 128 presets. When GPI input 8 is closed to ground, then the preset selected by GPI inputs 1 to 7 will become active.

5.8.   CONFIGURING MISCELLANEOUS FUNCTIONS

The *Utilities* menu is used to configure various miscellaneous items.

Upgrade	Allows the user to upgrade the module firmware
Factory Reset	Clears all the Card Configuration menus and sets the Presets to pass all VBI lines. It will not clear memory containing User Line Captures.
Reset User Line Captures	Clears all memory containing User Line Captures.
About…	Displays the module firmware and hardware version information.

5.8.1. Initiating a Software Upgrade

```
Utilities
  Upgrade
    Yes
    Cancel
```

This menu item is used to initiate an upgrade of the module firmware.

In addition to the firmware upgrade support detailed in this manual (See the *Upgrading Firmware* section of this manual for more information), you can initiate an upgrade with this command. This will allow you to upgrade the software without unplugging the card and changing the upgrade jumper.

After selecting the upgrade operation, you must change the command to *Yes* and press the pushbutton before the upgrade can take place. You can abort the operation by pressing the pushbutton when *Cancel* is displayed.

After the upgrade has finished, the unit will automatically restart and run in normal operating mode.

5.8.2. Restoring the Module to its Factory Default Configuration

```
Utilities
  Factory reset
    Yes
    Cancel
```

This menu item is used to restore all controls back to their factory defaults.

After selecting the reset operation, you must change the command to *Yes* and press the pushbutton before the command takes place. After the command, all parameters will be set to their factory default. You can abort the operation by pressing the pushbutton when *Cancel* is displayed.

Factory reset will NOT clear memory containing User Line Captures.

5.8.3. Clearing the Memory containing User Line Captures

```
Utilities
  Clear User Line
  Captures
    Yes
    Cancel
```

This menu item is used to remove all captured lines from the User memories.

After selecting the clear operation, you must change the command to *Yes* and press the pushbutton before the command takes place. After the command, all user memories will be cleared. You can abort the operation by pressing the pushbutton when *Cancel* is displayed.

5.8.4. Accessing Information About this Module and its Firmware

```
Utilities
  About...
```

This menu item lists the particulars about this module and the firmware residing within it. It gives quick access to information about revisions that can be used to determine when upgrades are required.
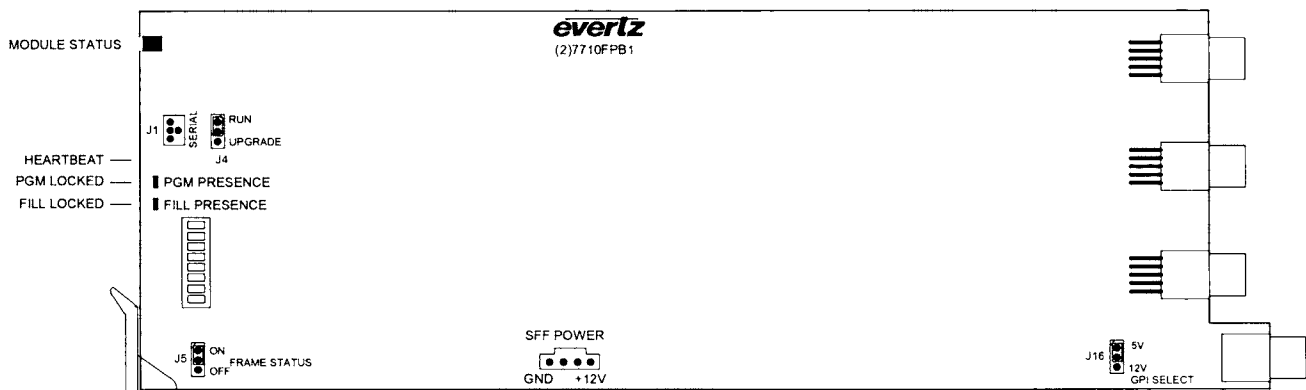
6.   JUMPERS AND LOCAL CONTROLS

Figure 6-1: Location of Jumpers on Main Board (Rev. 2)

6.1.   SELECTING WHETHER LOCAL FAULTS WILL BE MONITORED BY THE GLOBAL FRAME STATUS

The FRAME STATUS jumper J5, located at the front of the main board, determines whether local faults (as shown by the Local Fault indicator) will be connected to the 7700FR frame's global status bus.

FRAME STATUS   To monitor faults on this module with the frame status indicators (on the Power Supply FRAME STATUS LED's and on the Frame's Fault Tally output) install this jumper in the On position. (default). When this jumper is installed in the Off position local faults on this module will not be monitored.

6.2.   CONFIGURING THE MODULE FOR FIRMWARE UPGRADES

UPGRADE   The UPGRADE jumper located on the top module at the bottom, front is used when firmware upgrades are being done to the module. For normal operation it should be installed in the *RUN* position. Firmware upgrades can also be initiated from the *Utilities* menu (See section 5.8.1) See the *Upgrading Firmware* section in the front of the binder for more information.

To upgrade the firmware in the module using the manual procedure, pull the module out of the frame. Move the jumper into the *UPGRADE* position. Install the Upgrade cable provided (located in the vinyl pouch in the front of this manual) onto the SERIAL header at the card edge. Re-install the module into the frame. Run the upgrade as described in the *Upgrading Firmware* section in the front of the manual binder. Once the upgrade is complete, remove the module from the frame, move the jumper into the *RUN* position, remove the upgrade cable and re-install the module. The module is now ready for normal operation.

To upgrade the firmware in the module using the *Upgrade* menu item, install the Upgrade cable provided (located in the vinyl pouch in the front of this manual) onto the SERIAL header at the card edge. Go to the *Upgrade* menu item as described in section 5.8.1. Complete the upgrade as described in sections 1.2.1.2 to 1.2.1.4 of the *Upgrading Firmware* section of this manual binder. Once the upgrade is complete, remove the upgrade cable. The module is now ready for normal operation.

7. VISTALINK® REMOTE MONITORING/CONTROL

7.1. WHAT IS VISTALINK®?

VistaLINK® is Evertz's remote monitoring and configuration platform which operates over an Ethernet network using Simple Network Management Protocol (SNMP). SNMP is a standard computer network protocol that enables different devices sharing the same network to communicate with each other. VistaLINK® provides centralized alarm management, which monitors, reports, and logs all incoming alarm events and dispatches alerts to all the VLPro Clients connected to the server. Card configuration through VistaLINK® PRO can be performed on an individual or multi-card basis using simple copy and paste routines, which reduces the time to configure each module separately. Finally, VistaLINK® enables the user to configure devices in the network from a central station and receive feedback that the configuration has been carried out.

There are 3 components of SNMP:

1. An SNMP manager, also known as a Network Management System (NMS), is a computer running special software that communicates with the devices in the network. Evertz *VistaLINK®* Pro Manager graphical user interface (GUI), third party or custom manager software may be used to monitor and control Evertz VistaLINK® enabled products.

2. Managed devices (such as 7725VBI-K-HD), each with a unique address (OID), communicate with the NMS through an SNMP Agent. Evertz VistaLINK® enabled 7700 series modules reside in the 3RU 7700FR-C MultiFrame and communicate with the manager via the 7700FC VistaLINK® frame controller module, which serves as the Agent.

3. A virtual database, known as the Management Information Base (MIB), lists all the variables being monitored, which both the Manager and Agent understand. Please contact Evertz for further information about obtaining a copy of the MIB for interfacing to a third party Manager/NMS.

For more information on connecting and configuring the VistaLINK® network, see the 7700FC Frame Controller chapter.

7.2. VISTALINK GUI SCREENS

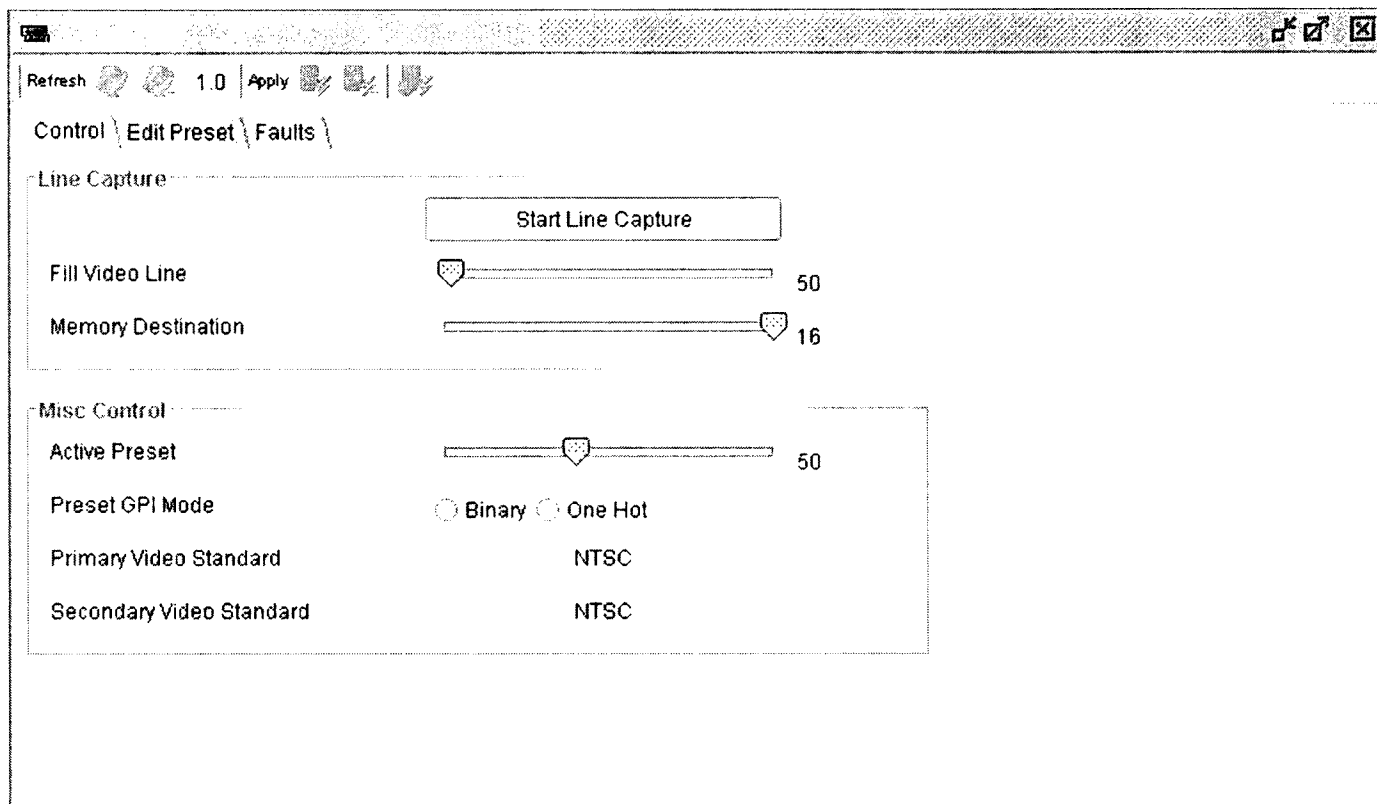The following screen shots show the VistaLINK® GUI screens.
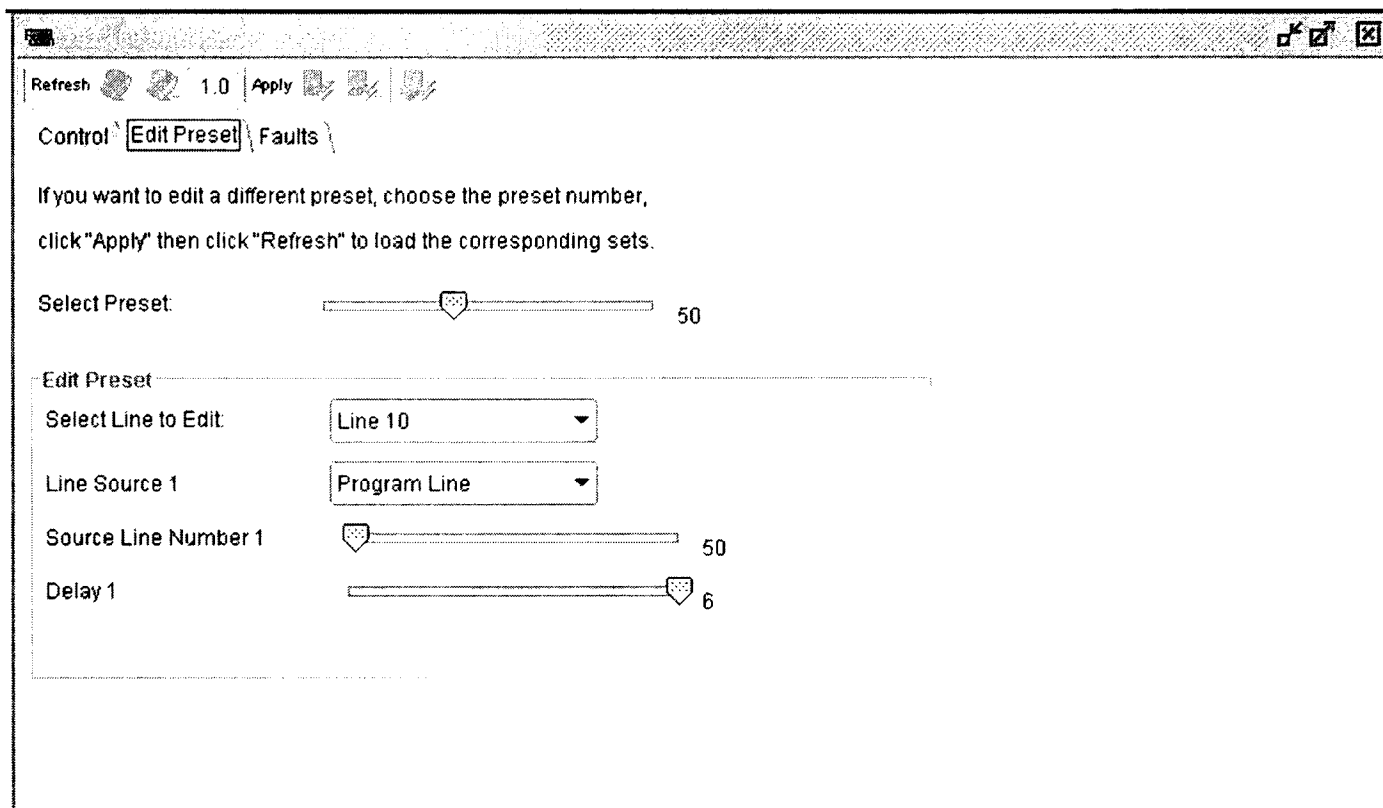

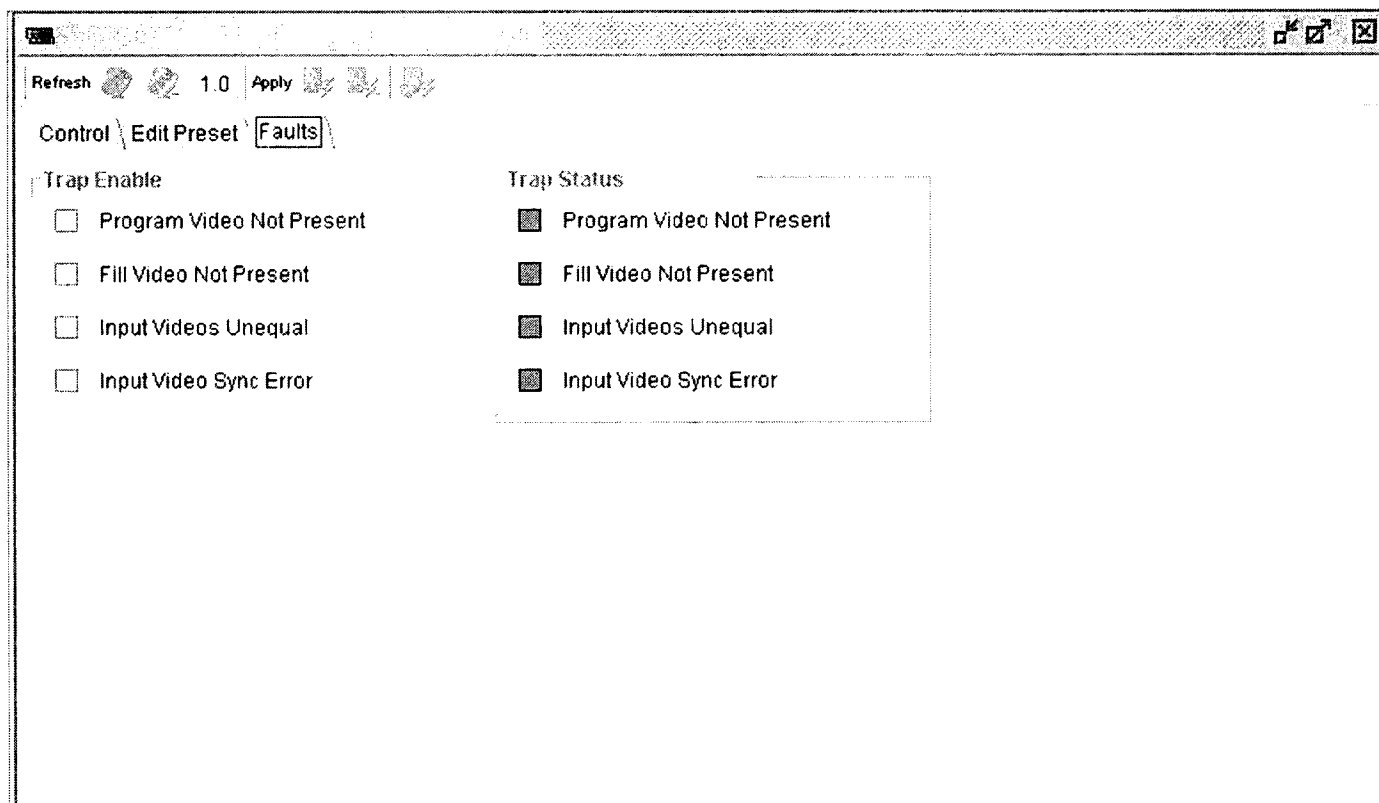
Figure 7-1: Control Tab

Figure 7-2: Edit Preset Tab

Figure 7-3: Faults Tab

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TABLE OF CONTENTS

Figures

Tables

REVISION HISTORY

REVISION	DESCRIPTION	DATE
0.1	Preliminary Version	Feb 02
1.0	Fixed minor typos	Mar 04
1.1	Fixed minor typos	Jul 04
1.2	Updated list of test signals, fixed minor typos	Jul 05

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1. OVERVIEW

The 7725VBI-K is a device that is a multi-function VBI keyer. Every program input vertical interval video line can be programmed to pass upstream video, blank the line, insert any VBI line from the SDI Key input, insert a selectable VITS (vertical interval test signal), or insert a user captured test signal. The unit provides the capability to store different VBI configurations as presets and recall them from the card edge control or via 8 opto-isolated GPI inputs. The 7725VBI-K is setup via a card edge control and an on screen display.

This unit is often used in critical on-air applications and hence bypass relay protection of the program video path is provided.

Features:
- One SDI 525 or 625, 270 Mb/s component digital program video input
- Video input relay bypass for power failure bypass protection.
- One SDI 525 or 625, 270 Mb/s component digital Key video input.
- One composite analog video output with On Screen Menu text.
- A comprehensive on screen menu is available to configure the various features of the module.
- 128 different preset for storing VBI keying configurations
- Up to 64 line patterns may be captured from any key input line and stored in User Memories for later insertion on any VBI line.
- Extensive library of Factory preset test signals.
- Each line of VBI independently programmable to pass, blank, insert from key signal, insert from user memory or insert factory test signal
- On Air Preset configuration selected with GPI or Menu selection
- Non-volatile memory protects current configuration in case of power loss.
- Fully hot swappable from front of frame.
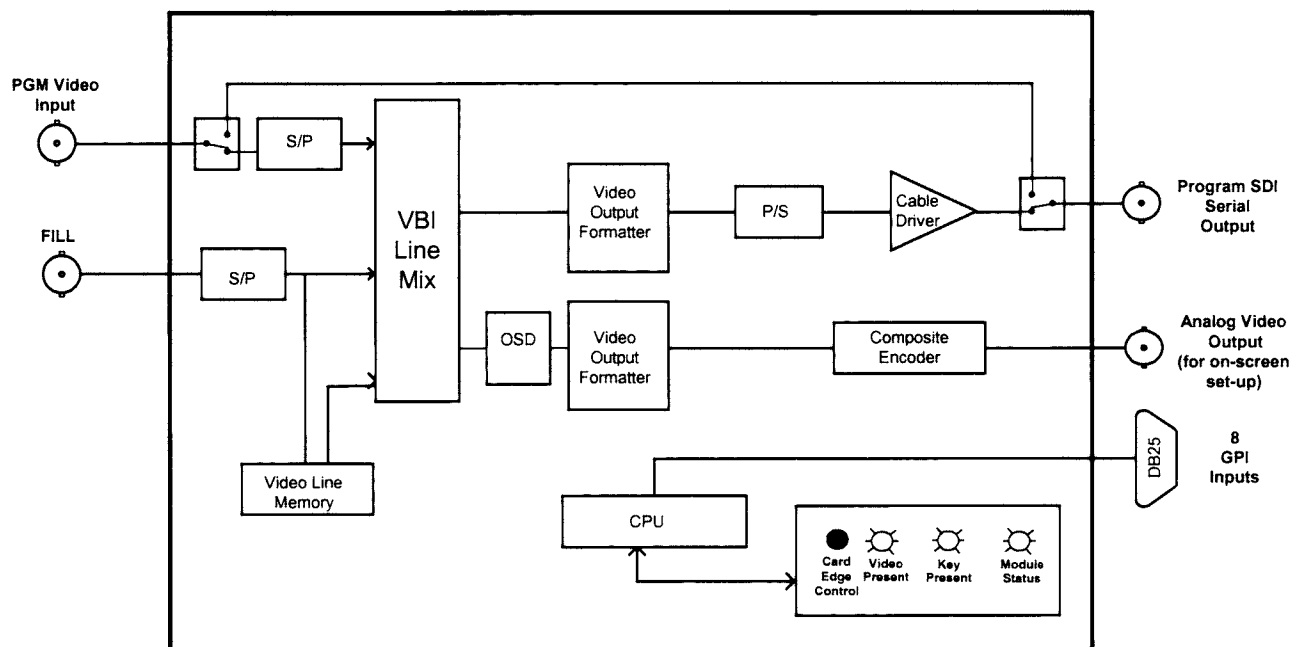
Figure 1: 7725VBI-K Block Diagram

The following sections outline several possible applications.

1.1. MASTER CONTROL OUTPUT CHAIN PROTECTION

Typically there are several units "chained" together on the output of a master control switcher. Units such as caption encoders, A.M.O.L. encoders, VITS inserters, data encoders, etc. are typically connected in series in the program output so that if one unit fails the network output will fail. The 7725VBI-K allows you to have one point of insertion in the program output path.
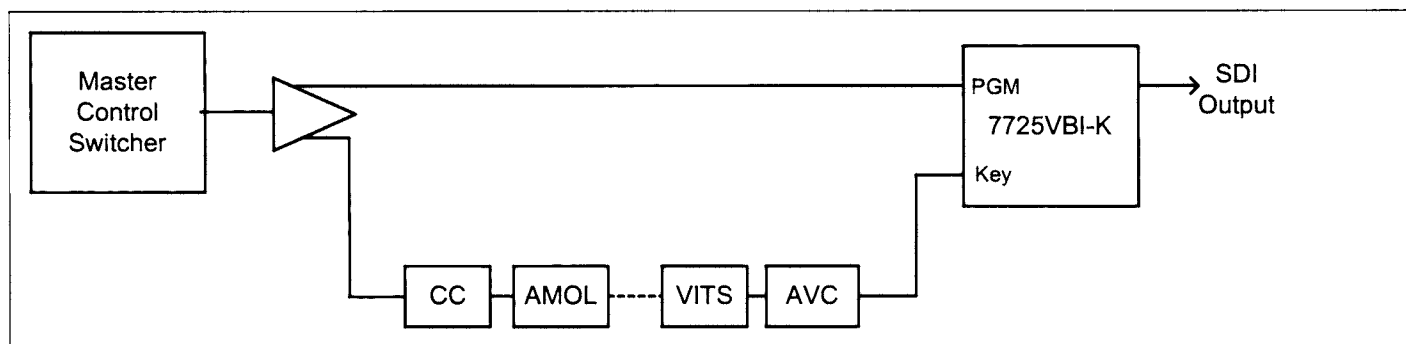
Figure 2: Master Control VBI Insertion Application

1.2. SQUEEZE BACK CC BYPASS.

This application shows Line 21 caption squeeze back bypass also known as VBI bridging. Some processing devices modify or destroy VBI data such as captioning or VITC. An example of this occurs with some DVE's during a squeeze back application. The 7725VBI-K device will provide a bypass of VBI around the processing device.
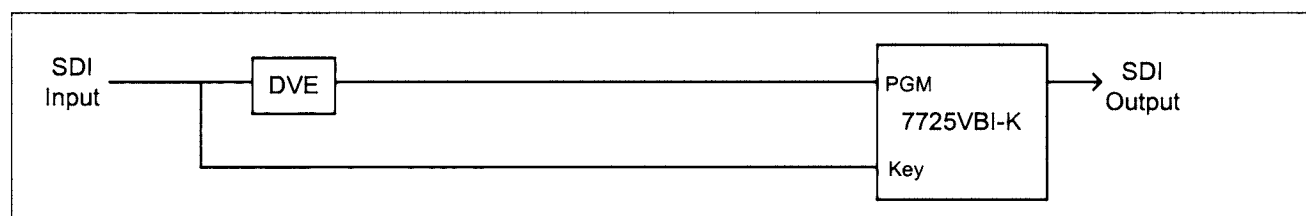
Figure 3: VBI Data Bridge Application

1.3. VBI LINE SHUFFLER

By providing the same feed to both inputs of the 7725VBI-K the unit will allow the user to modify the VBI and move lines as necessary.
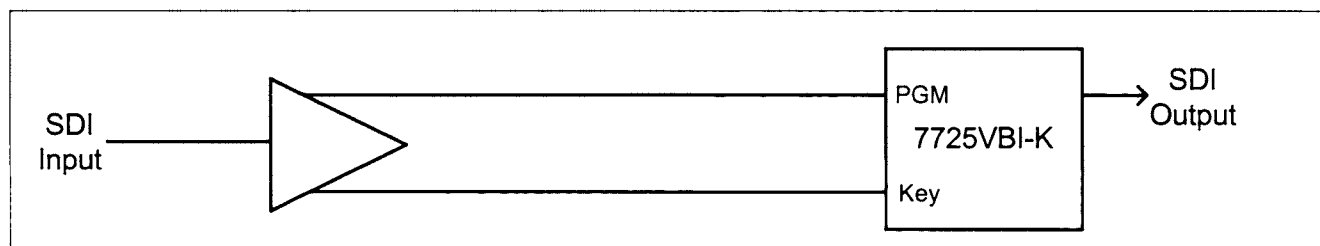
Figure 4: VBI Line Shuffle Application

2. INSTALLATION

The 7725VBI-K comes with a companion rear plate that has five BNC connectors and one 25 pin female D connector. Modules occupy two slots in the 7700FR-C frame. For information on mounting the rear plate and inserting the module into the frame see the 7700FR chapter section 3.
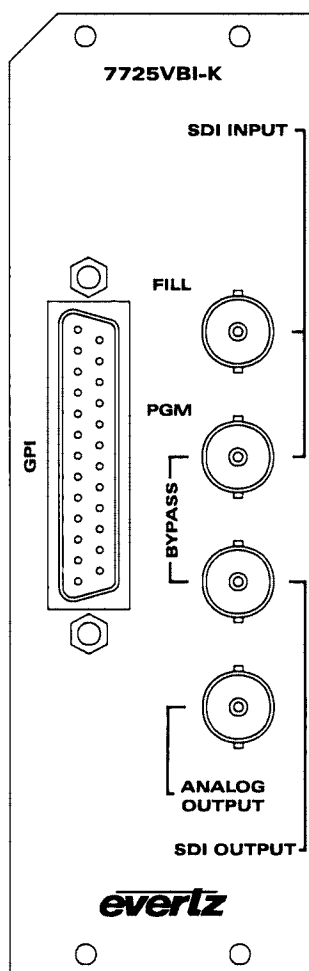
Figure 5: 7725VBI-K Rear Panel

2.1. VIDEO IN AND OUT

FILL This BNC connector is used to supply the signal that you want to insert into the VBI of the program video. Supply a 10-bit serial digital video signal compatible with the SMPTE 259M-C standard. This input will be referred to as the Key input throughout this manual.

PGM Input BNC connector is used to supply the program video to the inserter. Supply a 10-bit serial digital video signal compatible with the SMPTE 259M-C standard.

SDI OUTPUT There is one BNC connector that contains the PGM input video with the VBI signals inserted. This output is protected by a bypass relay, which will activate in the event of power loss to the module.

ANALOG OUTPUT This BNC connector contains the PGM input video with the VBI signals as an analog composite video signal and is used for monitoring purposes. The analog output is also used to display the On Screen programming menu.

2.2. GENERAL PURPOSE INPUTS

Table 1 shows the pinout of the 25 pin Female D GPI connector. The GPI's are active low with internal pull up resistors (4.7k Ohms) to +5V.

To make an input active, lower the signal to near ground potential (i.e. connect to shell or chassis ground). This can be done with a switch, relay, TTL drive, GPO output or other similar method. Figure 6 shows the input circuit for the General Purpose inputs. The *GPI Mode* menu item is used to configure the operation of the GPI inputs. (See section 5.7)
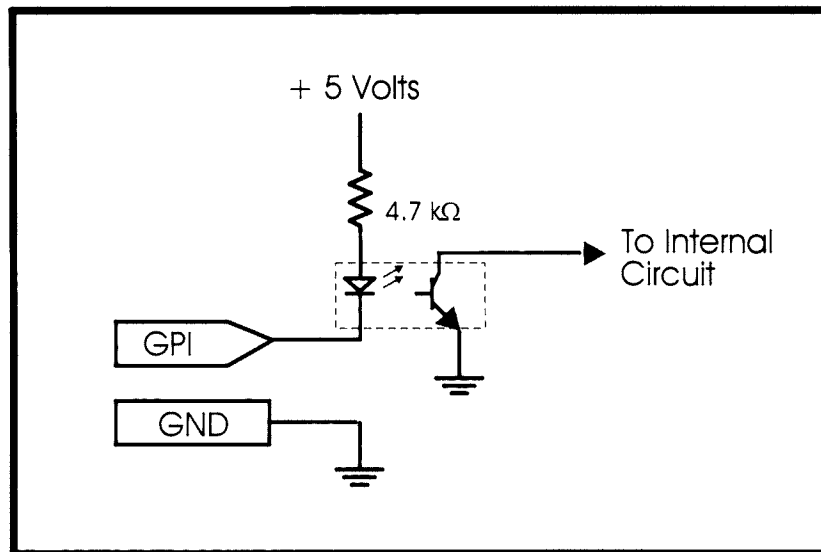
Figure 6: GPI Input Circuitry

DB-25	Name	Description
1	---	Not used
2	---	Not used
3	GPI1	General Purpose Input 1
4	GPI2	General Purpose Input 2
5	---	Not used
6	---	Not used
7	---	Not used
8	---	Not used
9	---	Not used
10	---	Not used
11	GPI3	General Purpose Input 3
12	GPI4	General Purpose Input 4
13	GPI5	General Purpose Input 5
14	GPI7	General Purpose Input 7
15	GPI8	General Purpose Input 8
16	---	Not used
17	---	Not used
18	---	Not used
19	---	Not used
20	---	Not used
21	Ground	Ground
22	---	Not used
23	---	Not used
24	---	Not used
25	GPI6	General Purpose Input 6
Shell	GND	Ground

Table 1: GPI Pinouts

3. SPECIFICATIONS

3.1. SERIAL VIDEO INPUT

Standard: SMPTE 259M-C
Number of Inputs: 1 for Program video (PGM)
1 for Key Signal to insert (FILL)
PGM and FILL need to be synchronous and timed w.r.t. each other (+/- 1/2 line)
Connector: BNC input per IEC 60169-8 Amendment 2
Equalization: Automatic 250m (min) @ 270 Mb/s with Belden 8281 or equivalent cable
Return Loss: > 15 dB

3.2. SERIAL VIDEO OUTPUTS

Number of Outputs: 1 (Bypass Protected)
Connector: BNC per IEC 60169-8 Amendment 2
Signal Level: 800mV nominal
DC Offset: 0V ±0.5V
Rise and Fall Time: 470ps nominal
Overshoot: <10% of amplitude
Wide Band Jitter: < 0.2UI (Reclocked).
Return Loss: > 15 dB

3.3. ANALOG VIDEO OUTPUT

Standard: NTSC (SMPTE 170M), PAL ITU624-4
Number of Outputs: 1
Connector: BNC per IEC 60169-8 Amendment 2
Signal Level: 1V nominal
DC Offset: 0V +/- 0.1V
Return Loss: >35 dB up to 5MHz
Frequency Response: 0.8 dB to 4 MHz
Differential Phase: <0.9deg. (<0.6deg. typical)
Differential Gain: <0.9% (<0.5% typical)
SNR: >56 dB to 5MHz (shallow ramp)

3.4. GENERAL PURPOSE IN/OUT

Number of Inputs: 8
Type: Opto-isolated, active low with internal pull-ups to +5V
Connector: Female DB-25
Input signal: Closure to ground
Signal Level: +5V nominal

3.5. ELECTRICAL

Voltage: +12VDC
Power: 6 Watts.
EMI/RFI: Complies with FCC regulations for class A devices.
Complies with EU EMC directive.

3.6. PHYSICAL

7700 or 7701 frame mounting:
Number of slots: 2

4. STATUS INDICATORS AND DISPLAYS

4.1. STATUS INDICATOR LEDS

There are two LEDS on the main board that indicate general module health.

LOCAL FAULT: This Red LED indicates poor module health and will be On if a local input power fault exists (i.e.: a blown fuse) or if the module fails to boot (e.g.: upgrade jumper left on). The LOCAL FAULT indication can also be reported to the frame through the FRAME STATUS jumper.

MODULE OK: This Green LED indicates good module health. It will be On when the board power is good and the module has booted successfully.

There are three LEDs on the submodule.

LD2 (RUN): This Green LED will be blinking when the module is operating normally.

LD3 (KEY VIDEO): This Green LED indicates the presence of a valid Key video input signal.

LD4 (PGM VIDEO): This Green LED indicates the presence of a valid Program video input signal.

5. ON SCREEN MENUS

5.1. NAVIGATING THE ON SCREEN MENU SYSTEM

A toggle switch and pushbutton at the front card edge are used to navigate a set of on-screen menus used to configure the card. To enter the on-screen menu system, press the pushbutton once. This will bring you to the main setup menu where you can use the toggle switch to move up and down the list of available sub menus. An arrow (>) moves up and down the left hand side of the menu items to indicate which item you are currently choosing. There is also a line of text at the bottom of the screen to give instructions about the function of the menu item. Once the arrow is on the desired item, press the pushbutton to select the next menu level.

On all menus, there are two extra selectable items: *Back* and *Exit*. Selecting *Back* will take you to the previous menu (the one that was used to get into the current menu) while *Exit* will return the display to its normal operating mode. On the main menu, BACK and EXIT will both take you to the normal operating mode.

Once in a sub menu, there may be another menu layer, or there may be a list of parameters to adjust. If there is another set of menu choices, use the toggle switch to select the desired menu item and press the pushbutton.

To adjust any parameter, use the toggle switch to move up or down to the desired parameter and press the pushbutton. The arrow will move to the right hand side of the line (<) indicating that you can now adjust the parameter. Using the toggle switch, adjust the parameter to its desired value. If the parameter is a numerical value, the number will increase if you lift the toggle switch and decrease if you push down on the toggle switch. If the parameter contains a list of choices, you can cycle through the list by pressing the toggle switch in either direction.

When you have stopped at the desired value, depress the pushbutton. This will update the parameter to the selected value and move the arrow back to the left side of the parameter list (>). Continue selecting and adjusting other parameters or use the *Back* or *Exit* commands.

Throughout the descriptions of the On Screen Menu items, default values are shown in <u>underlined</u> text.

5.2. TOP LEVEL MENU STRUCTURE

The following is a brief description of the top level of the menu tree that appears when you enter the On screen menu. Selecting one of these items will take you down into the next menu level.

Module Status	Shows module Status (Video standard, Key Standard, Preset Control, Active Preset and Delay)
User Capture	Used to Capture signals to the User Signal Memories
Edit Presets	Main configuration section used to configure each of the 128 Presets
Active Preset	Choose which preset is active
GPI Mode	Configures How the GPI inputs will work
Utilities	Miscellaneous utilities such as firmware version, firmware upgrade, and clearing out the preset and user capture memories.

5.3. DISPLAYING THE MODULE STATUS

The *Module Status* menu item is used to display the current status of the module. It brings up a screen shows the items shown in

PGM Video	Shows video standard and video present status
Key Video	Shows video standard and video present status
Preset Control	Shows if preset is being set from GPI or manually from the menu
Active Preset	Shows the active preset number
Delay Lines	Shows the delay being applied to time the Key Video to the PGM video

Table 2: Module Status

5.4.   WORKING WITH THE USER SIGNAL MEMORIES

The 7725VBI-K VBI Inserter has the ability to capture up to 64 line patterns from any VBI line and store them in User Memory locations for later insertion on any VBI line. The *User Capture* menu is used to Capture signals to the various user memories.

Source Video Line	Selects the line number of the Key Video signal that will be captured.
User Memory Destination	Selects the user memory location where the signal will be stored.
Start the User Capture	Capture selected line to the user memory when set to *Yes.*

5.4.1. Capturing Lines to the User Line Memories

First you need to choose the line that you wish to capture from the Key Input. Select the *Source Video Line* menu item using the toggle switch and press the pushbutton. Use the toggle switch to set the line number that you want to capture. Press the pushbutton again to save this value.

Next you need to choose the User memory location where you will store the captured line. Select the *User Memory Location* menu item using the toggle switch and press the pushbutton. Use the toggle switch to set the user memory location where you want to store the captured signal. Press the pushbutton again to save this value. There are 64 user memory locations available for storage.

Next select the *Start Capture* menu item using the toggle switch and press the pushbutton. Use the toggle switch to change the value to "yes". Press the pushbutton to capture the selected source line to the selected user memory location.   If you use the toggle switch to change the value to *cancel*, pressing the pushbutton will exit the menu without capturing anything.

✍	**The capture process may take a few seconds to complete.**

5.5.   CONFIGURING THE USER PRESETS

The 7725VBI-K VBI Inserter has 128 memory locations to store VBI Line Configuration presets. Each preset contains a complete set of VBI line signal settings.   The *Edit Presets* menu is used to configure each of the preset memories.

Edit Preset	Selects the Preset number that you will be changing.
Edit VBI Config	Selects the desired processing for each VBI line of the preset
Display VBI Config	Provides a quick overview of the preset and shows the processing for all VBI lines.

5.5.1. Selecting one of the Preset Memories to View/Edit

First you need to choose the Preset number that you wish to edit. Select the *Edit Preset* menu item using the toggle switch and press the pushbutton. Use the toggle switch to set the preset number that you want to change or view. Press the pushbutton again to save this value.

5.5.2. Configuring the VBI Processing for a Preset

First select the preset you want to edit using the *Edit Preset* menu. (See section 5.5.1) Then select the *Edit VBI Config* menu item using the toggle switch and press the pushbutton. You will be presented with the following menu choices.

5.5.2.1. Selecting the VBI Line number

```
EDIT PRESETS
   Edit VBI Config
      Output Line
         10
```

Select a particular line of the VBI to configure. The permitted line numbers include lines for both field 1 and field 2 of the input video standard. The valid VBI lines are shown below.

	Field 1	Field 2
NTSC	8-32, 253-262	271-295, 516-525
PAL	6-30, 303-312	319-343, 616-625

5.5.2.2. Selecting the Signal Source for a VBI Line

```
EDIT PRESETS
   Edit VBI Config
      Line Source
         Program
         Key Input
         User
         Factory
         Blank
```

Select the source line that you want keyed onto the selected VBI Line.

Select *Program* to pass through the program video unchanged.

Select *Key Input* to insert a line from the Key video over the program video. Select the specific line of the Key video you want inserted using the *Source Line* menu item.

Select *User* to insert a line from one of the User Memories over the program video. Select the specific User memory you want inserted using the *Source Line* menu item.

Select *Factory* to insert one of the factory supplied signals over the program video. Select the specific factory signal you want inserted using the *Source Line* menu item.

Select *Blank* to blank the selected line of the program video.

5.5.2.3. Selecting the Signal Line Number You want Inserted

```
EDIT PRESETS
   Edit VBI Config
      Source Line
         Line or source
         number
```

The function of this menu item depends on the setting of the *Line Source* menu item.

Line Source = Program: This menu item does nothing.

Line Source = Key Input: Select a particular line of the Key Video to insert. The permitted line numbers include lines for both field 1 and field 2 of the input video standard.

Line Source = User: Select a captured line stored in one of the User Memories to insert.

Line Source = Factory: Select one of the Factory supplied signals to insert. See Table 3 for a list of the Factory supplied test signals and their signal numbers.

5.5.2.4. Selecting The How Much Delay You Want Added To The Source Line

```
EDIT PRESETS
   Edit VBI Config
      Add Frames of
      Delay
         0
         0 to 6
```

This menu item allows the user to add one or more frames of delay to the Key Video line before it is inserted. This menu only has effect when the *Line Source* menu item is set to Key Input.

5.5.2.5. Factory Supplied Test Signals

The following test signals are available within the 7725VBI-K VBI inserter.

Number	Name NTSC	Name PAL
1	100% White	100% White
2	50% Gray	50% Gray
3	75% SMPTE Colourbars	CCIR Line 17
4	100% SMPTE Colourbars	CCIR Line 18
5	FCC Composite	CCIR Line 330
6	FCC Multiburst	CCIR Line 331
7	GCR System C	75% Colourbars
8	GCR Waveform	100% Colourbars
9	Linear 5 Step Staircase	GCR System C
10	Multiburst 100% / 4.2 MHz	Linear 5 Step Staircase
11	Multiburst 60% / 4.2 MHz	Multiburst 100% / 5.8 MHz
12	Modulated 5-Step Staircase	Multiburst 60% / 5.8 MHz
13	Modulated Ramp	Modulated Staircase
14	Multipulse 4.2 MHz	Pulse & Bar
15	NTC7 Combination	Modulated Ramp
16	NTC7 Composite	Ramp
17	Ramp	Shallow Ramp
18	Red Line	Sin (X)/X
19	Shallow Ramp	Sweep 60% to 5.5 MHz
20	Sin (X)/X 4.75 MHz	Sweep 100% t0 5.5 MHz
21	Sweep 60% / 4.2 MHz	
22	Sweep 60% / 5.5 MHz	
23	Valid Ramp	
24	VIRS	
25	75% Full Field Colourbars	
26	100% Full Field Colourbars	

Table 3: Factory programmed Test Signals

5.5.3. Viewing the VBI Processing for a Preset

First select the preset you want to view using the *Edit Preset* menu. (See section 5.5.1) Then select the *Display VBI Line* menu item using the toggle switch and press the pushbutton. The screen will show each line of the VBI and the action that will be formed on it. The *Source* column shows whether the Program video will be passed through, whether the line will be keyed from the Key video, one of the User Memories, or one of the factory supplied test signals. Use the toggle switch to scroll through the complete range of VBI lines. Press the pushbutton to return to the *Edit Presets* menu.

5.6. CHOOSING THE ACTIVE PRESET

The 7725VBI-K VBI Inserter has 128 memory locations to store user defined VBI Line Configuration presets. Each preset contains a complete set of VBI line signal settings.

ACTIVE PRESET
_0_
0 to 127
GPI

This menu item allows the user to determine the active preset or to configure the GPI inputs to recall the active preset.

When this menu item is set to one of the preset numbers, that preset will become active when you press the pushbutton.

When this menu item is set to *GPI*, then the GPI inputs will control which preset is active. The GPI inputs operate in one of two modes controlled by the *GPI Mode* menu item.

5.7. CONFIGURING THE GPI INPUTS

GPI MODE
One-Hot
Binary

The 7725VBI-K VBI Inserter has 8 GPI inputs that can be used to recall one of the presets remotely. This menu item is used to configure one of two GPI modes.

When this menu item is set to *One-Hot* the 8 GPI inputs will activate presets 1 to 8 respectively when they are closed to ground. Preset 0 will be selected when none of the GPIs are active

When this menu item is set to *Binary*, the GPI inputs 1 to 7 are binary encoded to select one of the 128 presets. When GPI input 8 is closed to ground, then the preset selected by GPI inputs 1 to 7 will become active.

5.8. CONFIGURING MISCELLANEOUS FUNCTIONS

The *Utilities* menu is used to configure various miscellaneous items.

Upgrade	Allows the user to upgrade the module firmware
Factory Reset	Clears all the Card Configuration menus and sets the Presets to pass all VBI lines. User memories are **not** cleared.
Reset User Memories	Clears all User Memories
About...	Displays the module firmware and hardware version information.

5.8.1. Initiating a Software Upgrade

Utilities
Upgrade
Yes
Cancel

This menu item is used to initiate an upgrade of the module firmware.

In addition to the firmware upgrade support detailed in this manual (See the *Upgrading Firmware* section of this manual for more information), you can initiate an upgrade with this command. This will allow you to upgrade the software without unplugging the card and changing the upgrade jumper.

After selecting the upgrade operation, you must change the command to *Yes* and press the pushbutton before the upgrade can take place. You can abort the operation by pressing the pushbutton when *Cancel* is displayed.

After the upgrade has finished, the unit will automatically restart and run in normal operating mode.

5.8.2. Restoring the 7725VBI-K to its Factory Default Configuration

Utilities
Factory reset
Yes
Cancel

This menu item is used to restore all controls back to their factory defaults.

After selecting the reset operation, you must change the command to *Yes* and press the pushbutton before the command takes place. After the command, all parameters will be set to their factory default. You can abort the operation by pressing the pushbutton when *Cancel* is displayed.

5.8.3. Clearing the User Memories

Utilities
Clear User Memories
Yes
Cancel

This menu item is used to remove all captured lines from the User memories.

After selecting the clear operation, you must change the command to *Yes* and press the pushbutton before the command takes place. After the command, all User memories will be cleared. You can abort the operation by pressing the pushbutton when *Cancel* is displayed.

5.8.4. Accessing Information About this Module and its Firmware

Utilities
About...

This menu item lists the particulars about this module and the firmware residing within it. It gives quick access to information about revisions that can be used to determine when upgrades are required.
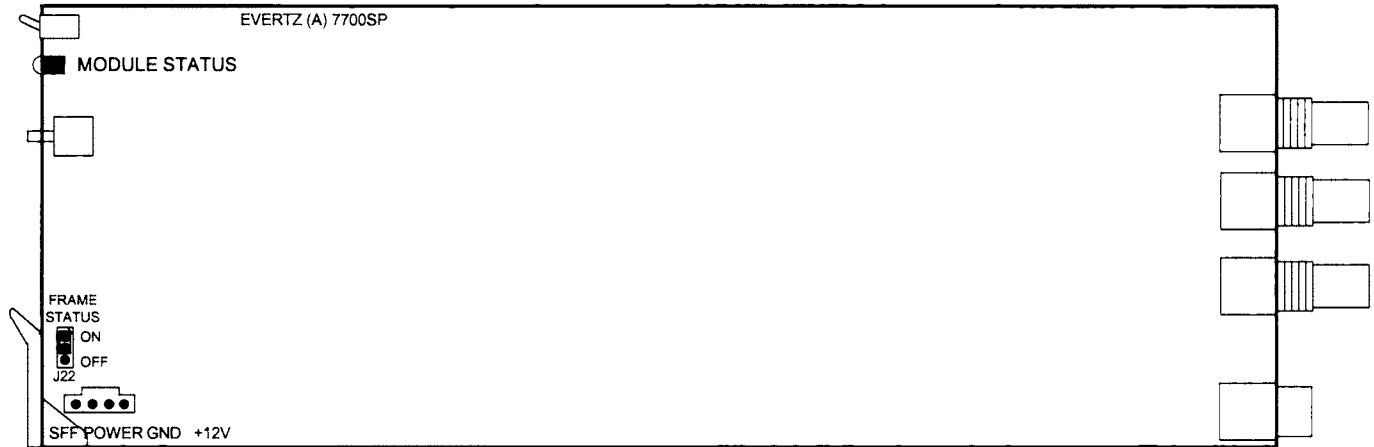
6.   JUMPERS AND LOCAL CONTROLS

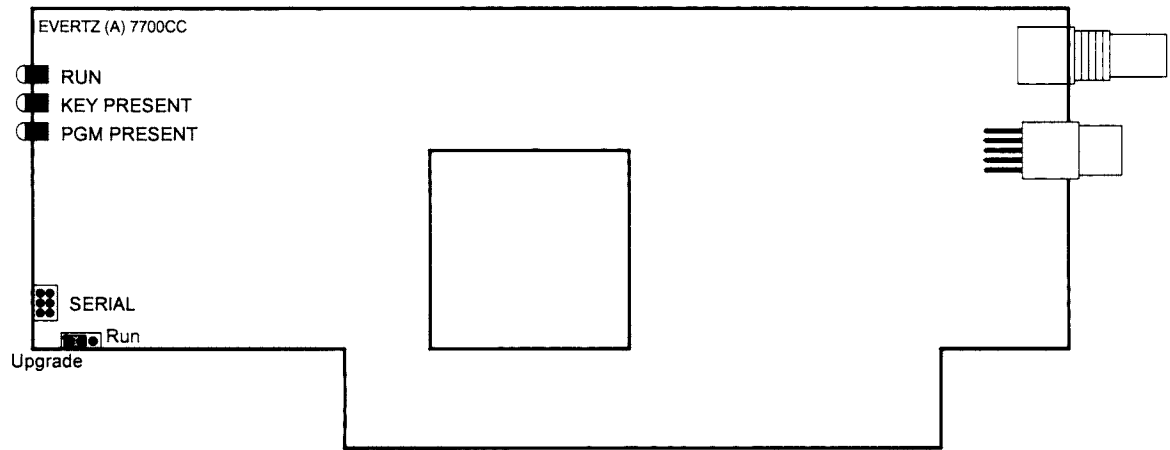**Figure 7: Location of Jumpers on Main Board (7700SP)**

Figure 8: Location of Jumpers on Submodule (7700CC)

6.1.   SELECTING WHETHER LOCAL FAULTS WILL BE MONITORED BY THE GLOBAL FRAME STATUS

The FRAME STATUS jumper J22 located at the front of the main board determines whether local faults (as shown by the Local Fault indicator) will be connected to the 7700FR frame's global status bus.

FRAME STATUS   To monitor faults on this module with the frame status indicators (on the Power Supply FRAME STATUS LED's and on the Frame's Fault Tally output) install this jumper in the On position. (default)

When this jumper is installed in the Off position local faults on this module will not be monitored.

6.2. CONFIGURING THE MODULE FOR FIRMWARE UPGRADES

UPGRADE   The UPGRADE jumper located on the top module at the bottom, front is used when firmware upgrades are being done to the module. For normal operation it should be installed in the *RUN* position. Firmware upgrades can also be initiated from the *Utilities* menu (See section 5.8.1) See the *Upgrading Firmware* section in the front of the binder for more information.

To upgrade the firmware in the module using the manual procedure, pull the module out of the frame. Move the jumper into the *UPGRADE* position. Install the Upgrade cable provided (located in the vinyl pouch in the front of this manual) onto SERIAL header at the card edge. Re-install the module into the frame. Run the upgrade as described in the *Upgrading Firmware* section in the front of the binder of this manual. Once the upgrade is completed, remove the module from the frame, move the jumper into the *RUN* position, remove the upgrade cable and re-install the module. The module is now ready for normal operation.

To upgrade the firmware in the module using the *Upgrade* menu item, install the Upgrade cable provided (located in the vinyl pouch in the front of this manual) onto SERIAL header at the card edge. Go to the *Upgrade* menu item as described in section 5.8.1. Complete the upgrade as described in sections 1.2.1.2 to 1.2.1.4 of the *Upgrading Firmware* section of this manual. Once the upgrade is completed, remove the upgrade cable. The module is now ready for normal operation.

TABLE OF CONTENTS

Figures

Tables

REVISION HISTORY

REVISION	**DESCRIPTION**	**DATE**
1.0	Original Version	Jun 05

1. OVERVIEW

The 7700DA7-HD Reclocking Distribution Amplifier provides reliable distribution of your 1.5 Gb/s HDTV and 143 Mb/s to 540 Mb/s standard definition serial digital video signals. The 7700DA7-HD features one auto-equalized input with seven reclocked outputs. The 7700DA7-HD has been designed to reclock at 1.5 Gb/s and 143 Mb/s to 540 Mb/s. In non-reclocking mode it can be used as a distribution product for SMPTE 310M (19.4 Mb/s) and all rates up to 1.5 Gb/s.

The 7700DA7-HD occupies one card slot in the 3 RU frame, which will hold up to 15 modules or the 1RU frame, which will hold up to three modules.

Features:
- Reclocking mode for SMPTE 292M (1.5 Gb/s), SMPTE 259M (143 to 360 Mb/s), SMPTE 344M (540 Mb/s) or DVB-ASI signals - auto detects correct bitrate
- Non-reclocking mode for signals from 19.4 Mb/s (SMPTE 310M) up to 1.5 Gb/s
- Fully hot-swappable from front of frame with no BNC disconnect required
- Independent isolated output drivers to ensure no cross channel loading effects (i.e. no need to terminate unused outputs)
- Outputs maintain polarity from input to output for DVB-ASI applications.
- Tally output on Frame Status bus upon loss of input signal for quality monitoring
- VistaLINK™ - enabled offering remote monitoring, control and configuration capabilities via SNMP. VistaLINK™ is available when modules are used with the 3RU 7700FR-C frame and a 7700FC VistaLINK™ Frame Controller module in slot 1 of the frame using the model 9000NCP Network Control Panel or Evertz VistaLINK™ PRO or other third party SNMP manager software.
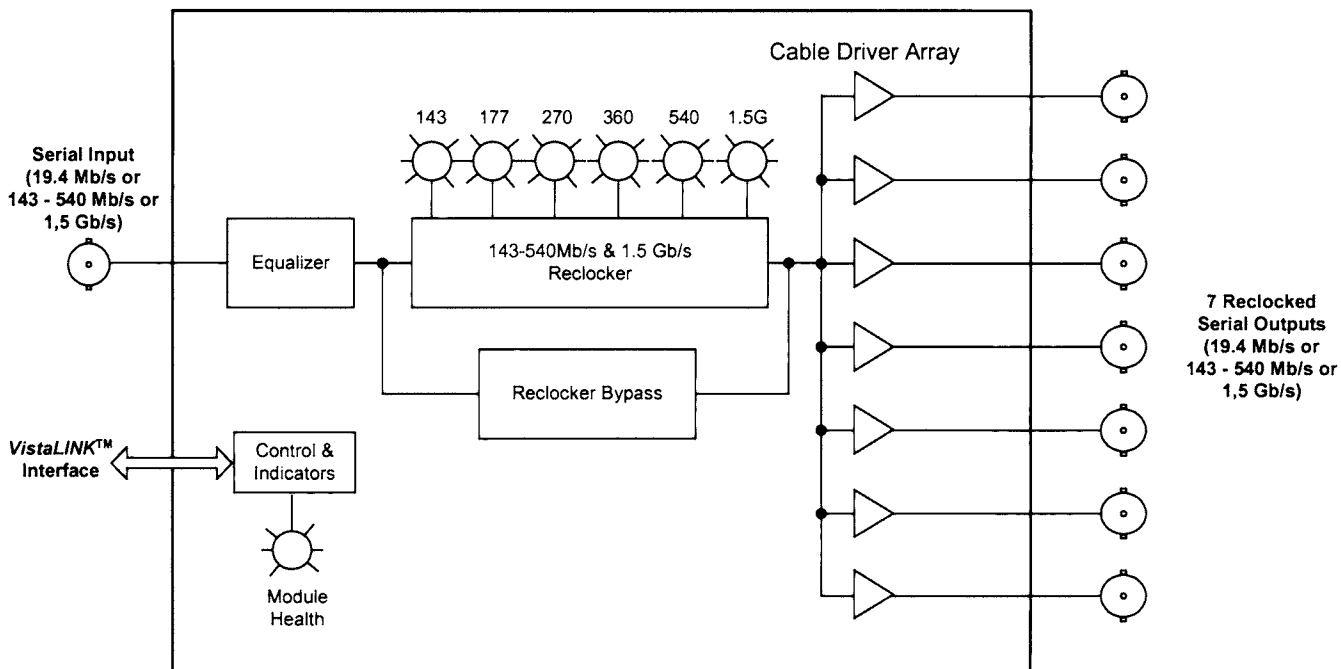
Figure 1: 7700DA7-HD Block Diagram

2. INSTALLATION

The 7700DA7-HD comes with a companion rear plate that occupies one slot in the frame. For information on inserting the module into the frame see the 7700FR chapter section 3.
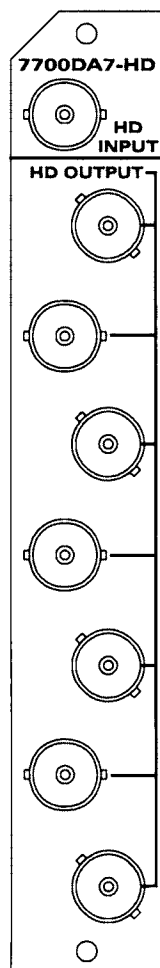
Figure 2: 7700DA7-HD Rear IO Module

SDI INPUT   Input BNC connector for 10-bit serial digital video signals compatible with the SMPTE 292M, SMPTE 259M, DVB-ASI or SMPTE 310M standard. See section 5.2 for information on choosing the correct video standard.

SDI OUTPUT There are seven BNC connectors with reclocked serial component video outputs, compatible with the SMPTE 292M, SMPTE 259M / DVB-ASI, or SMPTE 310M standard.

3. SPECIFICATIONS

3.1. SERIAL VIDEO INPUT

Standards:
   Reclocking Mode: SMPTE 292M SMPTE 259M A, B, C, D (143 to 360 Mb/s),
                             SMPTE 344M (540 Mb/s) DVB-ASI, or M2S
   Non reclocking Mode: SMPTE 310M (19.4 Mb/s) to 1.5 Gb/s
Connector: 1 BNC per IEC 60169-8 Amendment 2
Equalization: Automatic to 130m @ 1.5 Gb/s with Belden 1694A or equivalent cable
Return Loss: > 15 dB up to 1.5 Gb/s

3.2. SERIAL VIDEO OUTPUTS

Number of Outputs: 7 Reclocked
Connector: BNC per IEC 60169-8 Amendment 2
Signal Level: 800mV nominal
DC Offset: 0V ±0.5V
Rise and Fall Time:
   SD Video   740ps nominal
   HD Video   200ps nominal
Overshoot: < 10% of amplitude
Return Loss: > 15 dB up to 1.5 Gb/s
Wide Band Jitter: < 0.2 UI

3.3. ELECTRICAL

Voltage: + 12VDC
Power: 5 Watts
Safety: CSA Listed to CSA C22.2 No. 60065-03, UL 60065-03
                    IEC 60065-(2001-12) 7th Edition
                    Complies with CE Low voltage Directive 93/68/EEC
EMI/RFI: Complies with FCC regulations for class A devices.
                    Complies with EU EMC directive 89/336/EEC

3.4. PHYSICAL

Number of slots: 1

4. STATUS LEDS

The 7700DA7-HD has eight LED Status indicators on the front card edge to show operational status of the card at a glance. Figure 3 shows the location of the LEDs.

Two large LEDs on the front of the board indicate the general health of the module

LOCAL FAULT: This Red LED indicates poor module health and will be On during the absence of a valid input signal or if a local input power fault exists (i.e.: a blown fuse). The LOCAL FAULT indication can also be reported to the frame through the FRAME STATUS jumper.

MODULE OK: This Green LED indicates good module health. It will be On when a valid input signal is present, and board power is good.

There are six small LEDs that indicate the status of the equalizer and reclocker.

LOCK: This Green LED will be On when there is a valid signal present at the module input.

RECLOCKER RATE: There are 5 LEDs that indicate the rate (143, 177, 270, 360 or 540 Mb/s) that the reclocker is currently using when the Rate jumper is set to the 259M/344M position.

5. JUMPERS AND USER ADJUSTMENTS
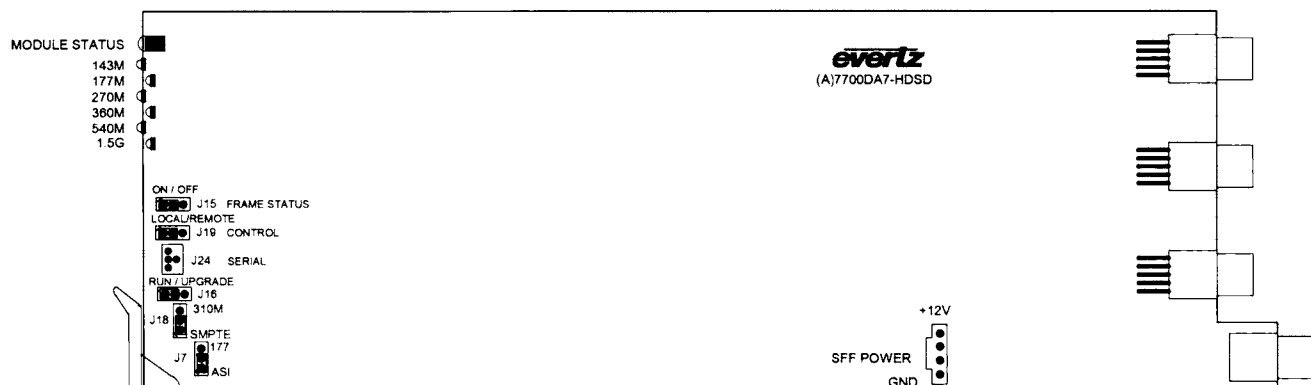
Figure 3: LED and Jumper Locations

5.1. SELECTING WHETHER LOCAL FAULTS WILL BE MONITORED BY THE GLOBAL FRAME STATUS

The FRAME STATUS jumper J15, located at the front of the module determines whether local faults (as shown by the Local Fault indicator) will be connected to the 7700FR frame's global status bus.

FRAME STATUS: To monitor faults on this module with the frame status indicators (on the power supply's FRAME STATUS LED's and on the Frame's Fault Tally output) install this jumper in the On position.

When this jumper is installed in the Off position local faults on this module will not be monitored.

5.2. SELECTING WHETHER MODULE WILL BE CONTROLLED FROM THE LOCAL CONTROLS OR THROUGH THE *Vista*LINK™ INTERFACE

The CONTROL jumper J19 selects whether the module will be controlled from the local jumpers or through the *Vista*LINK™ interface.

CONTROL   When this jumper is installed in the LOCAL position, the card functions are controlled through the local jumpers.

When this jumper is installed in the REMOTE position, the card functions are controlled through the *Vista*LINK™ interface.

5.3. SELECTING THE RECLOCKING RATE

The RATE jumper J18, located at the front of the module near the card ejector, determines whether the module will operate as a reclocking distribution amplifier with SMPTE 292M, SMPTE 259M or 344M (143 to 540 Mb/s) or DVB-ASI video signals or with SMPTE 310M (19.4 Mb/s) signals

RATE SELECT: To set the module to operate with SMPTE 292M, SMPTE 259M, SMPTE 344M or DVB-ASI signals install the jumper in the SMPTE position.

To set module to operate with SMPTE 310M signals install the jumper in the 310M position.

The SUPPORT jumper J7, located at the front of the module near the card ejector, determines whether the module will operate as a reclocking distribution amplifier with SMPTE 292M or SMPTE 259M or 344M (143 to 540 Mb/s) or DVB-ASI video signals.

SUPPORT: To set the module to operate with SMPTE 292M, SMPTE 259M or SMPTE 344M signals install the jumper in the 177 position.

To set module to operate with DVB-ASI signals install the jumper in the DVB position.

5.4. CONFIGURING THE MODULE FOR FIRMWARE UPGRADES

UPGRADE   The UPGRADE jumper J16 located at the front of the module near the card ejector, is used when firmware upgrades are being done to the module. For normal operation it should be installed in the *RUN* position. See the *Upgrading Firmware* section in the front of the binder for more information.

To upgrade the firmware in the module unit pull it out of the frame. Move Jumper J16 into the *UPGRADE* position. Install the Upgrade cable provided (located in the vinyl pouch in the front of this manual) onto header J24. Re-install the module into the frame. Run the upgrade as described in the *Upgrading Firmware* section in the front of the binder. Once the upgrade is completed, remove the module from the frame, move J16 to the *RUN* position, remove the upgrade cable and re-install the module. The module is now ready for normal operation.

6.   *VISTA*LINK™ REMOTE MONITORING/CONTROL

6.1.   What is *Vista*LINK™?

*Vista*LINK™ is Evertz's remote monitoring and control capability over an Ethernet network using Simple Network Management Protocol (SNMP). SNMP is a standard computer network protocol that enables different devices sharing the same network to communicate with each other. For monitoring there needs to be a detecting device that automatically reports all errors to a central alarm and error logging station. We also need to be able to interrogate individual detector devices from the central station to determine the status of individual channels. Finally, we need to be able to configure devices in the network from the central station and receive feedback that the configuration has been carried out.

There are 3 components of SNMP:

1. An SNMP manager also known as a Network Management System (NMS) is a computer running special software that communicates with the devices in the network. Evertz *Vista*LINK™ Pro Manager graphical user interface (GUI), third party or custom manager software may be used to monitor and control Evertz *Vista*LINK™ enabled products.

2. Managed devices (such as 7700DA7-HD), each with a unique address (OID), communicate with the NMS through an SNMP Agent. Evertz VistaLINK™ enabled 7700 series modules reside in the 3RU 7700FR-C MultiFrame and communicate with the manager via the 7700FC VistaLINK™ frame controller module, which serves as the Agent.

3. A virtual database known as the Management Information Base (MIB) lists all the variables being monitored and which both the Manager and Agent understand. Please contact Evertz for further information about obtaining a copy of the MIB for interfacing to a third party Manager/NMS.

For more information on connecting and configuring the *Vista*LINK™ network, see the 7700FC Frame Controller chapter.

6.2.   *Vista*LINK™ MONITORED PARAMETERS

The following parameters can be remotely monitored through the *Vista*LINK™ interface.

Parameter	Description
Detected Video Standard	Indicates the detected video standard
Video Locked	Indicates whether or not there is a video lock.
Card Type	Indicates version of the module (7700DA7 / 7700DA7-HD)
Master Jumper	Indicates whether the card is in Remote or Local Mode (position of the CONTROL jumper)

Table 1: *Vista*LINK™ Monitored Parameters

6.3. *Vista*LINK™ CONTROLLED PARAMETERS

Parameter	Description
Video Standard	Sets the current video standard you wish to lock to
Bypass Mode	Sets the reclocker mode. If 'none', the reclocker is never bypassed. If 'auto', the reclocker is auto-bypassed when the PLL is not locked. If 'force', the reclocker is always bypassed
Autolocking Mode	Sets the auto locking to DVB/ASI or 177Mb/s mode

Table 2: *Vista*LINK™ Controlled Parameters

6.4. *Vista*LINK™ TRAPS

Trap	Description
Video Lock	Triggers when there is no video lock

Table 3: *Vista*LINK™ Traps

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TABLE OF CONTENTS

Figures

Tables

REVISION HISTORY

REVISION	DESCRIPTION	DATE
0.1	Preliminary version	May 06

1. OVERVIEW

The Evertz 7732DVP-HD Dual Link Video Processor module is a multi-purpose module designed to convert between 4:2:2 and 4:4:4 HDTV video signals in a wide variety of applications. The model 7732DVP-HD can be operated in a dual link to single link mode for emerging 4:4:4 high definition applications, or a 4:2:2 to 4:4:4 mode to convert traditional high definition content to 4:4:4.

The 7732DVP-HD occupies one card slot in the 3 RU frame, which will hold up to 15 modules or the 1RU frame, which will hold up to three modules.

Features:

- Two serial digital 1.5 Gb/s HD inputs per SMPTE 292M
- Three serial digital 1.5 Gb/s HD inputs per SMPTE 292M
- Supports most international standards including 1080i/60, 1080i/59.94, 1080i/50, 1080p/24sF, 1080p/23.98sF, 1080p/30, 1080p/29.97, 1080p/25, 1080p/24, 1080p/23.98, 720p/60, 720p/59.94, 720p/50
- 4:4:4 Dual Link HDSDI to 4:2:2 HDSDI converter
- 4:2:2 HDSDI to 4:4:4 Dual Link HDSDI converter
- retimed 4:4:4 dual link outputs
- 3:2 pulldown inserter – locked to RP188 time code or 6 Hz pulse
- 6 Hz input
- programmable LUTS for 4:4:4 and 4:2:2 HDSDI
- To accommodate different colorimetry between monitoring devices
- handles logarithmic 'filmstream' inputs from VIPER camera – load through serial port
- store/recall user presets of common configurations – up to 10 presets
- GPI control inputs to select operating modes or load user presets.
- Card edge menu using OSD on 4:2:2 output to configure the operating modes
- Card Edge LEDs for signal presence, module status
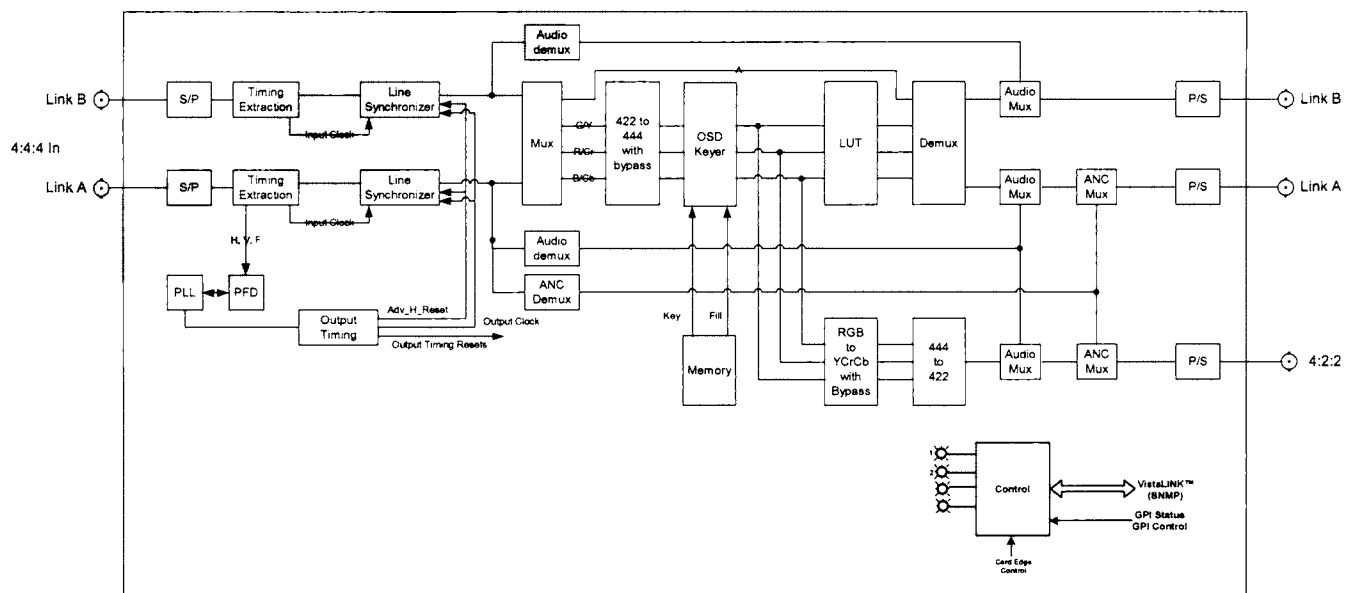
Figure 1: 7732DVP-HD Block Diagram

2.   INSTALLATION

The 7732DVP-HD comes with a companion rear plate that occupies one slot in the frame. For information on inserting the module into the frame see the 7700FR chapter section 3.
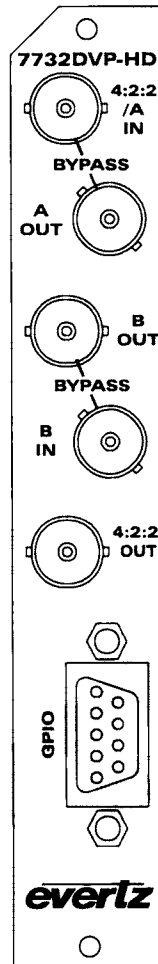
Figure 2: 7732DVP-HD Rear IO Module

2.1.   HDSDI VIDEO INPUTS AND OUTPUTS

4:2:2/A IN, B IN When operating the 7732DVP-HD in the 4:4:4 to 4:2:2 mode, these two BNC connectors are for connecting dual link 10-bit serial digital video input signals, compatible with the SMPTE 372M standard. When operating the 7732DVP-HD in the 4:2:2 to 4:4:4 mode connect the 4:2:2 input video compatible with the SMPTE 292M standard to the **4:2:2/A IN** BNC.

4:2:2/A OUT, B OUT When operating the 7732DVP-HD in the 4:4:4 to 4:2:2 mode, these two BNC connectors provide a reclocked and retimes output from the **4:2:2/A IN** and **B IN** input video. When operating the 7732DVP-HD in the 4:2:2 to 4:4:4 mode, the dual link Video ouput will be available on these two output BNCs.

4:2:2 OUT When operating the 7732DVP-HD in the 4:4:4 to 4:2:2 mode, this BNC contains a down sampled 4:2:2 copy of the dual link input video. When operating the 7732DVP-HD in the 4:2:2 to 4:4:4 mode, this BNC contains a reclocked copy of the **4:2:2/A IN** input video.

2.2. GENERAL PURPOSE INPUTS & OUTPUTS

Table 1 shows the pinout of the 9 pin Female D GPI connector. The 9 pin D connector has 6 general purpose inputs. The GPI inputs are active low. This means that if you leave an input floating (not connected) then it will not be activated. Lowering the GPI input to a voltage below 0.8 volts will activate the input. The user can activate GPIs simply by connecting the GPI input pins to Ground using a button, switch, relay or an open collector transistor. The inputs are internally pulled up to either +5 or +12 volts DC set by jumper J16. The *GPI* menu items on the *UTILITY* menu are used to configure the operation of the GPI inputs. (See section 6.4.3)
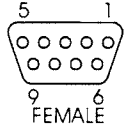
Pin #	Name	Description
1	GPI6	General Purpose Input 6
2	GPI2	General Purpose Input 2
3	GND	Signal Ground
4	GPI1	General Purpose Input 1
5	GPO2	General Purpose Output 2
6	GPI3	General Purpose Input 3
7	GPI4	General Purpose Input 4
8	GPI5	General Purpose Input 5
9	GPO1	General Purpose Output 1
Shell	GND	Frame Ground

Table 1: GPIO Connector Pinouts

Figure 3 shows the input circuit for the General Purpose inputs.
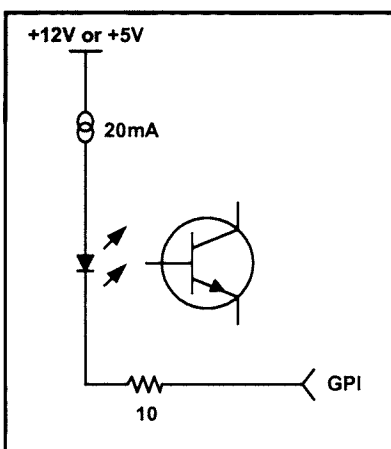
Figure 3: Typical GPI Input Circuitry.

3. SPECIFICATIONS

3.1. SERIAL VIDEO INPUT

Standard:	SMPTE 372M (dual Link 1.5 Gb/s) or SMPTE 292M (1.5 Gb/s) – auto-detects standard
	SMPTE 274M, SMPTE 296M – 1080i/60, 1080i/59.94, 1080i/50, 1080p/24sF, 1080p/23.98sF, 1080p/30, 1080p/29.97, 1080p/25, 1080p/24, 1080p/23.98, 720p/60, 720p/59.94, 720p/50
Connector:	2 BNC per IEC 60169-8 Amendment 2.
Input Equalization:	Automatic to 65m @ 1.5Gb/s with Belden 1694 or equivalent cable.
Return Loss:	>12 dB up to 1.5GHz

3.2. SERIAL VIDEO OUTPUTS

Standard:	Same as input
Number of Outputs:	2 dual link outputs, 1 single link output
Connector:	BNC per IEC 60169-8 Amendment 2
Signal Level:	800mV nominal
DC Offset:	0V ±0.5V
Rise and Fall Time:	200ps nominal for HD
Overshoot:	<10% of amplitude
Return Loss:	> 10 dB at 1.5 Gb/s (4:4:4 outputs)
	> -6 dB at 1.5 Gb/s (4:2:2 output)
Jitter:	< 0.16UI

3.3. GPIO CONTROL PORT

Number of Inputs:	6
Number of Outputs:	2
Type:	Opto-isolated, active low with internal pull-ups to +5 or +12V (jumper settable)
Connector:	9 pin female D
Signal Level:	closure to ground

3.4. INPUT TO OUTPUT PROCESSING DELAY (HD INPUT VIDEO)

Video Delay:	2 lines.

3.5. ELECTRICAL

Voltage:	+12VDC
Power:	10 Watts.
EMI/RFI:	Complies with FCC regulations for class A devices.
	Complies with EU EMC directive.

3.6. PHYSICAL

Number of slots:	1

4. STATUS INDICATORS

The 7700DVP-HD has 10 LED Status indicators on the main circuit board front card edge to show operational status of the card at a glance. Figure 4 shows the location of the LEDs and card edge controls.

Two large LEDs on the front of the board indicate the general health of the module

LOCAL FAULT: This Red LED indicates poor module health and will be On during the absence of a valid input signal or if a local input power fault exists (i.e.: a blown fuse). The LOCAL FAULT indication can also be reported to the frame through the FRAME STATUS jumper.

MODULE OK: This Green LED indicates good module health. It will be On when a valid input signal is present, and board power is good.

There are two small LEDs on the top side of the board (beside the DIP switch) that indicate that the 7732DVP-HD video inputs are present. The input signal must match the video standard setting for these LEDs to be on.

LINKA/4:2:2 PRESENT: This Green LED will be On when there is a valid signal present on module 4:2:2/Link A input.

LINK B PRESENT: This Green LED will be On when there is a valid signal present on module Link B input.

There are two small LEDs on the bottom side of the board.

LINKA/4:2:2 LOCKED: This Green LED will be On when the HDSDI input circuitry has locked to a valid signal present on module 4:2:2/Link A input.

LINK B LOCKED: This Green LED will be On when the HDSDI input circuitry has locked to a valid signal present on module Link B input.

4.1. AUDIO STATUS LEDs

Four LEDs located on the lower edge of the module (near the card extractor) indicate which audio groups are present in the input video. Audio group LED 1 is located closest to the center of the module.

Audio LED	Colour	Audio Group Status
1	Off	Neither group 1 nor group 2 present on input 1 video.
	Flashing	Only group 1 or group 2 present on input 1 video.
	Green	Both group 1 and group 2 present on input 1 video.
2	Off	Neither group 3 nor group 4 present on input 1 video.
	Flashing	Only group 3 or group 4 present on input 1 video.
	Green	Both group 3 and group 4 present on input 1 video.
3	Off	Neither group 1 nor group 2 present on input 2 video.
	Flashing	Only group 1 or group 2 present on input 2 video.
	Green	Both group 1 and group 2 present on input 2 video.
4	Off	Neither group 3 nor group 4 present on input 2 video.
	Flashing	Only group 3 or group 4 present on input 2 video.
	Green	Both group 3 and group 4 present on input 2 video.

Table 2: Audio Group Status LEDs

5. CARD EDGE CONTROLS

The 7732DVP-HD is equipped with an 8 position DIP switch, toggle switch, and a push button to allow the user to select various functions. All card functions are available through a menu system controlled by the toggle switch and push button and displayed on the On Screen character display (OSD). (See section 6.)

DIP switch 1 is located at the top of the DIP switch (farthest from to the card ejector). Table 3 gives an overview of the DIP switch functions.

> **There are two types of DIP switches possible. For slide switches the On (closed) position is farthest from the front edge of the printed circuit board. For 'piano key' switches the On (closed) position is down or closest to the printed circuit board.**

DIP Switch	Function
1	Reserved – set to Off
2	
3	
4	
5	
6	
7	
8	VistaLINK® or Local control Selection (future)

Table 3: DIP Switch Functions

5.1. SELECTING WHETHER MODULE WILL BE CONTROLLED FROM THE
LOCAL CONTROLS OR THROUGH THE **VistaLINK®** INTERFACE (NOT
IMPLEMENTED AT TIME OF WRITING)

The 7732DVP-HD can be controlled using the card edge DIP switches and menu system or remotely via SNMP using VistaLINK® PRO. See section 9 for a full description of the parameters that can be monitored or controlled using VistaLINK®. VistaLINK® control is only available when the card is installed in the 3RU 7700FR-C frame and a 7700FC VistaLINK® Frame Controller card is installed in slot 1 of the frame.

DIP switch 8 is used to enable or disable VistaLINK® control.

DIP 8	CONTROL MODE
Off	Local control mode. The module will be controlled using the menu system
On	VistaLINK® control mode. The module will be controlled remotely through SNMP. Or using the menu system

Table 4: VistaLINK® Mode Switch Settings

6. CARD EDGE MENUS

A toggle switch and pushbutton allow card edge navigation of a set of on-screen menus used to configure the card. To enter the on-screen menu system, press the pushbutton. This will bring you to the main Setup menu where you can use the toggle switch to move up and down the list of available sub menus. An arrow (➜) moves up and down the left hand side of the menu items to indicate which item you are currently choosing. Once the arrow is on the desired item, press the pushbutton to select the next menu level.

On all menus, there are two extra selectable items: *Back* and *Exit*. Selecting *Back* will take you to the previous menu (the one that was used to get into the current menu) while *Exit* will return the display to its normal operating mode. On the main menu, BACK and EXIT will both take you to the normal operating mode.

Once in a sub menu, there may be another menu layer, or there may be a list of parameters to adjust. If there is another set of menu choices, use the toggle switch to select the desired menu item and press the pushbutton.

To adjust any parameter, use the toggle switch to move up or down to the desired parameter and press the pushbutton. The arrow will move to the right hand side of the line (◀) indicating that you can now adjust the parameter. Using the toggle switch, adjust the parameter to its desired value. If the parameter is a numerical value, the number will increase if you lift the toggle switch and decrease if you push down on the toggle switch.

When you have stopped at the desired value, depress the pushbutton. This will update the parameter to the selected value and move the arrow back to the left side of the parameter list (➜). Continue selecting and adjusting other parameters or use the BACK or EXIT commands.

6.1.   TOP LEVEL MENU STRUCTURE

The OSD menu is arranged in a layered structure that groups similar configuration items together. The following section gives a brief description of the first level of menus that appear when you enter the OSD screens. Selecting one of these items will take you to the next menu level. Sections 6.2 to 6.4 provide detailed descriptions of each of the sub menus. The tables in sections 6.2 to 6.4 are arranged in an indented structure to indicate the path taken to reach the control. Menu items or parameters that are underlined indicate the factory default values.

VIDEO	Configures Video setup items
LOOK UP TABLES	Configures the Look Up table to be applied to the output video
UTILITY	Configures miscellaneous setup items

6.2.   CONFIGURING THE VIDEO CONTROLS

The *VIDEO* menus are used to configure parameters associated with the video input and output functions and the Source ID decoders. The chart below shows the items available in the *VIDEO* menu. Sections 6.2.1 to **Error! Reference source not found.** give detailed information about each of the menu items.

Input Type	Selects whether the input is single link to dual link
Video standard	Selects the input video standard
Colour Space	Selects the the colour space of the dual link 4:4:4 video
Loss of video	Selects the action to take when the input video is missing

6.2.1.   Selects the Action to Take when Input Video Is Missing.

VIDEO
Input Type
<u>Auto</u>   Single Link   Dual Link

This control is used to determine select whether the 7732DVP-HD has a 4:4:4 Dual link video input or a 4:2:2 single link input.

When set to *Auto*, the module will convert single link to dual link when there is only an input on the 4:2:2/A input. The module will convert dual link to single link when there is a valid dual link input on both Link A and Link B inputs.

When set to *Single Link,* the module will convert single link to dual link. 4:2:2 out is copy of 4:2:2/A in.

When set to *Dual Link*, the module will convert dual link to single link. Link A and Link B outpus are copies of Link A and Link B inputs with LUT applied

6.2.2. Setting the Video Standard

```
VIDEO
  Video standard
    Auto
    1080i/60
    1080i/59.94
    1080i/50
    1080p/24sF
    1080p/23.98sF
    1080p/30
    1080p/29.97
    1080p/25
    1080p/24
    1080p/23.98
    720p/60
    720p/59.94
    720p/50
```

This control is used to set the video standard for the card. If set to *Auto* mode, the card will adjust operation as needed for the incoming standard.

everlz

6.2.3. Selects the Colour Space of the 4:4:4 Dual Link Video

```
┌─────────────────────┐
│ VIDEO               │
├─────────────────────┤
│  Colour Space       │
├─────────────────────┤
│   YCbCr             │
│   RGB               │
│   FSRGB             │
└─────────────────────┘
```

When the *Input Type* menu item is set to *Dual Link* this control should be set to the colour space of the input 4:4:4 video.

Select *YCbCr* when the incoming video is in the 10 bit 4:4:4 YCbCr format. In the *YCbCr* mode, the RGB to YCbCr colour transformation for the 4:2:2 output will be disabled.

Select *RGB* when the incoming video is in the 10 bit 4:4:4 RGB format compliant with SMPTE 274M or SMPTE 296M. The RGB video has the three components scaled such that the extreme values are code words 040_h (64) and $3AC_h$ (940) in a 10-bit representation. In the *RGB* mode, the RGB to YCbCr colour transformation for the 4:2:2 output will be enabled.

Select *FSRGB* when the incoming video is in the extended range 10 bit 4:4:4 FSRGB format. The FSRGB video has its three components scaled such that the extreme values are code words 04_h (4) and $3FB_h$ (1019) in a 10-bit representation. In the *FSRGB* mode, the FSRGB to YCbCr colour transformation for the 4:2:2 MON output will be enabled, and the YCrCb 4:2:2 output video components will be scaled such that the extreme values are code words 040_h (64) and $3AC_h$ (940) in a 10-bit representation.

When the *Input Type* menu item is set to *Single Link* this control determines the colour space of the output 4:4:4 video.

Select *YCbCr* when the dual link output video should be in the 10 bit 4:4:4 YCbCr format. In the *YCbCr* mode, the YCbCr to RGB colour transformation for the 4:2:2 input will be disabled.

Select *RGB* when the dual link output video should be in the 10 bit 4:4:4 RGB format compliant with SMPTE 274M or SMPTE 296M. The 4:4:4 RGB output video will have its the three components scaled such that the extreme values are code words 040_h (64) and $3AC_h$ (940) in a 10-bit representation. In the *RGB* mode, the YCbCr to RGB colour transformation for the 4:2:2 input will be enabled.

Select *FSRGB* when the dual link output video should be in the extended range 10 bit 4:4:4 FSRGB format. The 4:4:4 FSRGB output video will have its three components scaled such that the extreme values are code words 04_h (4) and $3FB_h$ (1019) in a 10-bit representation. In the *FSRGB* mode, the YCbCr to RGB colour transformation for the 4:2:2 input will be enabled,

6.2.4. Selects the Action to Take when Input Video Is Missing.

VIDEO
Loss of video
Blue
Black
Pass

This control is used to determine what action to take when the video input is missing. The user can either have the output video go to black or blue or pass whatever data is at the input.

6.3. CONFIGURING THE LOOK UP TABLES

The *LOOK UP TABLES* menus are used to configure the look up table that will be applied to the output video. It is also used to load user look up tables to the 7732DVP-HD memory. The chart below shows the items available in the *LOOK UP TABLES* menu. Sections 6.2.1 to **Error! Reference source not found.** give detailed information about each of the menu items.

Active Lookup

Selects the active look up table

Upload User LUT

Initates a nuplad to one of the User Look up Table memories

6.3.1. Controlling whether the Look Up Table is Loaded

LOOK UP TABLES
Active Lookup
1:1
Kill R
Kill G
Kill B
FilmStream
User 1
User 2
User 3
User 4
User 5

This control is used to select the currently active look up table from one of the factory LUTs or one of the five user lookup table memories.
The *1:1* LUT effectively turns off the look up table function
The *Kill R* LUT removes all the Red
The *Kill G* Look Up table which removes all the Green
The *Kill B* Look Up table which removes all the Blue
The *Filmstream* LUT restores a Filmsteam encoded video to a linear space
Loads the *User 1* LUT
Loads the *User 2* LUT
Loads the *User 3* LUT
Loads the *User 4* LUT
Loads the *User 5* LUT

6.3.2. Uploading User Lookup Tables

LOOK UP TABLES
Upload User LUT
Cancel
User 1
User 2
User 3
User 4
User 5

This control is used to initiate an upload to one of the user look up table memories.

Install the Upgrade cable provided (located in the vinyl pouch in the front of this manual) onto header J24 near the card ejector. Connect the 9 pin D connector to a PC running Hyperterminal or some other terminal software.

After selecting the *Upload User LUT* menu, you must select the user look up table memory you want to upload to and press the pushbutton before the upload can take place. After pressing the pushbutton use the terminal software to sned the LUT as a text file to the 7732DVP-HD. See section xx for more information about Look up tables.

You can abort the upload operation by pressing the pushbutton when *Cancel* is displayed.

The Upload baud rate for the 7732DVP-HD modules is 115,200 baud, even parity 1 stop bit.

6.4. UTILITIES

The *UTILITY* menus are used to list the module firmware version, upgrade the firmware, and manage the user presets. The chart below shows the items available in the *UTILITY* menu. Sections 6.4.1 to 6.4.8 give detailed information about each of the parameters.

Recall Preset	Allows user to recall configurations from a user preset.
Store Preset	Allows user to store the current configuration of the card to a user preset.
GPI 1	Allows user to select the function of GPI input 1.
GPI 2	Allows user to select the function of GPI input 2.
GPI 3	Allows user to select the function of GPI input 3.
GPI 4	Allows user to select the function of GPI input 4.
GPI 5	Allows user to select the function of GPI input 5.
GPI 6	Allows user to select the function of GPI input 6.
GPO 1	Allows user to select the function of GPO output 1.
GPO 2	Allows user to select the function of GPO output 2.
Status Window	Allows user to turn the Status window OSD on and off.
Upgrade	Used to upgrade the firmware in the module.
Factory Reset	Perform a reset of the module to factory defaults
About...	Shows the firmware version of the module.

6.4.1. Recalling Card Configurations from the User Presets

UTILITY
Recall preset
Cancel
Preset 1
Preset 2
...
Preset 10

This control is used to restore the current card configuration from one of the saved user presets

After selecting the recall preset operation, you must select the preset number you want to recall and press the pushbutton before the recall will take place. You can abort the operation by pressing the pushbutton when *Cancel* is displayed.

6.4.2. Storing Card Configurations to the User Presets

UTILITY
Store preset
Cancel
Preset 1
Preset 2
...
Preset 10

This control is used to store the current card configuration into one of the saved user presets

After selecting the store preset operation, you must select the preset number you want to use to save the card configuration and press the pushbutton before the store will take place. You can abort the operation by pressing the pushbutton when *Cancel* is displayed.

6.4.3. Selecting the function of the GPI inputs

There are six menu items that are used to program the functions of the GPI inputs. For the sake of simplicity only the menu item for GPI1 will be described in the manual.

UTILITY
GPI 1
Off
Preset 1
Preset 2
...
Preset 10
1:1 LUT
Kill R LUT
Kill G LUT
Kill B LUT
FilmStream LUT
User 1 LUT
User 2 LUT
User 3 LUT
User 4 LUT
User 5 LUT
6 Hz Input
OSD Disable
Status Enable

This control is used to select the function of GPI input 1.

Turns off the GPI.
Recalls Preset 1
Recalls Preset 2

...
Recalls Preset 10
Loads the *1:1* Look Up Table
Loads the *Kill R* Look Up Table
Loads the *Kill G* Look Up Table
Loads the *Kill B* Look Up Table
Loads the *Filmstream* Look Up Table
Loads the *User 1* Look Up Table
Loads the *User 2* Look Up Table
Loads the *User 3* Look Up Table
Loads the *User 4* Look Up Table
Loads the *User 5* Look Up Table
Used the GPI input a s a 6 Hz input for 3:2 pulldown control (future)
Disables the On Screen Display on the 4:2:2 Out
Turns the Status Window on or Off

6.4.4. Selecting the function of the GPO Outputs

There are two menu items that are used to program the functions of the GPO outputs. For the sake of simplicity only the menu item for GPO1 will be described in the manual.

UTILITY
Gpo 1
4:2:2 Input Tally
4:4:4 Input Tally

This control is used to select the function of GPO output 1.

Tally when 4:2:2 video present and *Input Type menu* set to *Single Link*
Tally when 4:4:4 video present and *Input Type menu* set to *Dual Link*

6.4.5. Enabling the Status Window

```
UTILITY
  Status Window
     Off
     On
     GPI
```

This control is used to turn the status window on or off. The Status window shows the card status at a glance and is visible on the **4:2:2 OUT** video output.

When set to *On* the status window will always be On.
When set to *GPI* the status window can be controlled by one of the GPIs. See section 6.4.3 for information about programming the GPI functions.

The Status window will show the following items on the 4:2:2 Out when it is enabled.

Item	Value	Example
Input Type:	{input type detected | selected}	4:4:4
Link A:	present | missing	present
Link B:	present | missing	present
Video Standard:	{video standard detected | selected}	Auto: 1080p/23.98sF
Colour Space:	YCrCb | RGB | XYZ & GAMMA DETECT	RGB - Gamma out of range
2:3 Pulldown:	not applicable | active | disabled	active
Pulldown Reference:	not applicable | RP188 | 6 Hz | Auto	Auto: RP188
Active Lookup Table:	[List of LUTs}	User 1
GPI 1:	[List of functions} : active | inactive	Load Preset 1 : Inactive
GPI 2:	[List of functions} : active | inactive	Load Preset 2 : Inactive
GPI 3:	[List of functions} : active | inactive	Load Preset 3 : Inactive
GPI 4:	[List of functions} : active | inactive	Load Preset 4 : Inactive
GPI 5:	[List of functions} : active | inactive	Load Preset 5 : Inactive
GPI 6:	[List of functions} : active | inactive	6 Hz : active
GPO1:	[List of functions} : active | inactive	4:2:2 Tally : Active
GPO2:	[List of functions} : active | inactive	4:4:4 Tally : Active
Control Mode:	Local | Local & Vistalink	Local Control

Table 5: Status Display

6.4.6. Initiating a Software Upgrade

```
UTILITY
   Upgrade
      Cancel
      Yes
```

This control is used to initiate an upgrade of the module software.

In addition to the software upgrade support detailed in the *Upgrading Firmware* chapter in the front of the binder, you can initiate an upgrade with this control. This will allow you to upgrade the software without unplugging the card and changing the upgrade jumper.

After selecting the upgrade operation, you must change the command to *Yes* and press the pushbutton before the upgrade can take place. Follow the remainder of the instructions in the *Upgrading Firmware* chapter. You can abort the operation by pressing the pushbutton when *Cancel* is displayed.

After the upgrade has finished, the unit will automatically restart and run in normal operating mode.

The Upgrade baud rate for the 7732DVP-HD modules is 115,200 baud.

6.4.7. Restoring the Module to its Factory Default Configuration

```
UTILITY
   Factory reset
      Cancel
      Yes
```

This menu item is used to restore all controls back to their factory defaults.

After selecting the reset operation, you must change the command to *Yes* and press the pushbutton before the command takes place. After the command, all parameters will be set to their factory default. You can abort the operation by pressing the pushbutton when *Cancel* is displayed.

6.4.8. Accessing Information About this Module and its Firmware

```
UTILITY
   About...
```

This control lists the particulars about this module and the firmware residing within it. It gives quick access to information about revisions that can be used to determine when upgrades are required.

7. LOCATION OF LEDS AND JUMPERS
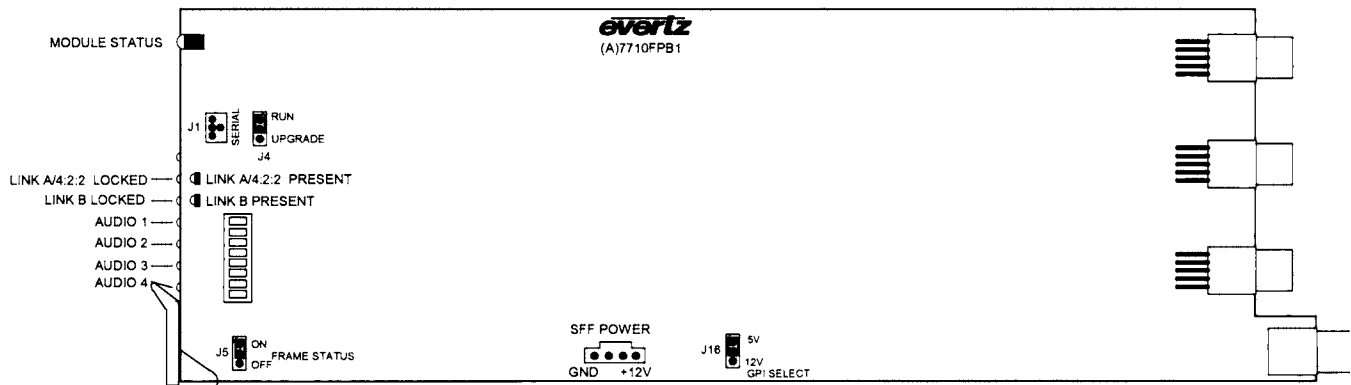
Figure 4: LED and Jumper Locations

7.1. SELECTING WHETHER LOCAL FAULTS WILL BE MONITORED BY THE GLOBAL FRAME STATUS

The FRAME STATUS jumper J5, located at the front of the module determines whether local faults (as shown by the Local Fault indicator) will be connected to the 7700FR frame's global status bus.

FRAME STATUS: To monitor faults on this module with the frame status indicators (on the power supply's FRAME STATUS LED's and on the Frame's Fault Tally output) install this jumper in the On position.

When this jumper is installed in the Off position local faults on this module will not be monitored.

7.2. CONFIGURING THE MODULE FOR FIRMWARE UPGRADES

UPGRADE The UPGRADE jumper J4 located at the front edge of the module, near the serial port header, is used when firmware upgrades are being done to the module. For normal operation it should be installed in the *RUN* position. See the *Upgrading Firmware* section in the front of the binder for more information.

To upgrade the firmware in the module pull it out of the frame. Move Jumper J4 into the *UPGRADE* position. Install the Upgrade cable provided (located in the vinyl pouch in the front of this manual) onto header J24 near the card ejector. Re-install the module into the frame. Run the upgrade as described in the *Upgrading Firmware* section in the front of the binder. Once the upgrade is completed, remove the module from the frame, move J4 into the *RUN* position, remove the upgrade cable and re-install the module. The module is now ready for normal operation.

Note that the baud rate for firmware upgrades is 115200 baud

7.3. CONTROLLING GPI PULLUP VOLTAGE

Jumper J16, located at the rear of the module controls whether the GPI inputs and outputs are pulled up to 5 volts or 12 volts.

GPI SELECT: To pull the GPI inputs and outputs up to 12 volts install this jumper in the position closest to edge of the module.

To pull the GPI inputs and outputs up to 5 volts install this jumper in the position closest to centre of the module.

8. MENU QUICK REFERENCE

VIDEO
├ Input Type
├ Video standard
├ Colour Space
└ Loss of video

LOOK UP TABLES
├ Active Lookup
└ Upload User LUT

Utilities
├ Recall Preset
├ Store Preset
├ GPI 1
├ GPI 2
├ GPI 3
├ GPI 4
├ GPI 5
├ GPI 6
├ GPO 1
├ GPO 2
├ Status Window
├ Upgrade
├ Factory Reset
└ About...

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Figures

Tables

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REVISION HISTORY

REVISION	DESCRIPTION	DATE
1.0	Original Version	June 99
1.1	Figure 3 updated to show correct location of jumpers and switches 7710MD-S added	Aug 99
1.2	Added section on adjusting the EQ threshold, Changed description of LOCAL FAULT and EQ LEDs	Oct 99
1.3	Features current for Firmware version 2.0 Support for Colour Space Conversion, Support for 1080i/50 and 1080p/24sF video formats, and auto standard detection Support for 7710MD-HSN	Mar 00
1.4	Added/changed sections documenting the sF option which is only available at order time and is required for 1080p/24sF support. Support for 1080p/24sF to PAL conversion.	May 00
1.5	Added specification for delay through the downconverter	Dec 00
1.5.1	Updated specifications	Feb 01
1.6	Features current for Firmware version 3.0 Support for 480P video format, auto video standard always enabled NTSC setup pedestal control, DIP switch functions redefined	Jan 02

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1.   OVERVIEW

The 7710MD series Monitoring Down Converter provides an inexpensive method of confidence monitoring your 1.5 Gb/s HDTV signals on standard definition monitors. The 7710MD is ideal to use with your existing standard resolution monitors whether they have analog or component serial digital inputs. The 7710MD accepts 1080i, 720p, and 480p (SMPTE 292M) video formats. (See Table 1 for a complete list of the video formats supported.)

When the 7710MD is fitted at the factory with the sF option, it will also accept 1080p/24 segmented frame inputs. In this mode, the 7710MD downconverts the 1080p/24sf input video to 525i/60 with a 3:2 pulldown or 625i/50 with a 24:25 pulldown. The 7710MD inserts extra fields to create the 3:2 or 24:25 pulldown of the picture content with a random pulldown cadence on the downconverted output.

The 7710MD is available in 5 different versions to meet a variety of applications. (See specifications for complete information)
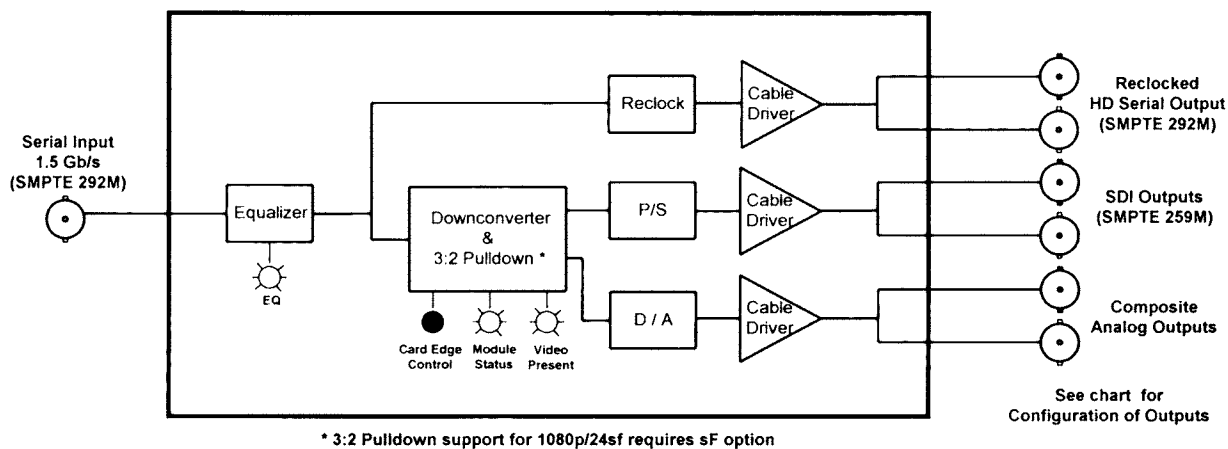
Figure 1: 7710MD Block Diagram

Model	HD 1.5 Gb/s Reclocked Outputs	Down converted Outputs	
		Component SDI	Composite Analog
7710MD-HS	2	2	---
7710MD-HN	2	---	2
7710MD-HSN	4	2	2
7710MD-SN	---	2	2
7710MD-S	---	4	---

The 7710MD has colour space conversion from ITU rec. 709 to ITU rec. 601, has selectable NTSC pedestal, and will provide various down converted formats such as letterbox, side crop and more.

Front panel LEDs indicate signal presence as well as equalization warning and or signal loss warning for broadcast applications.

Features:

- Letterbox, side crop and anamorphic squeeze down conversion formats
- 1080i/60, 1080i/50, 480p/60, or 720p/60 input formats
- 1080p/24sF support for with sF option (must be specified at order time)
- auto video standard detection
- 8 position DIP switch selects NTSC Pedestal, Input Format and Down-converted format
- ITU rec. 709 to ITU rec. 601 colour space conversion
- Tally output upon loss of input signal

2.   INSTALLATION

All the 7710MD series modules except the 7710MD-HSN come with a companion rear plate that has 5 BNC connectors and occupy one slot in the frame. The 7710MD-HSN comes with a companion rear plate that has 9 BNC connectors and occupies two slots in the frame. For information on mounting the rear plate and inserting the module into the frame see the 7700FR chapter section 3.
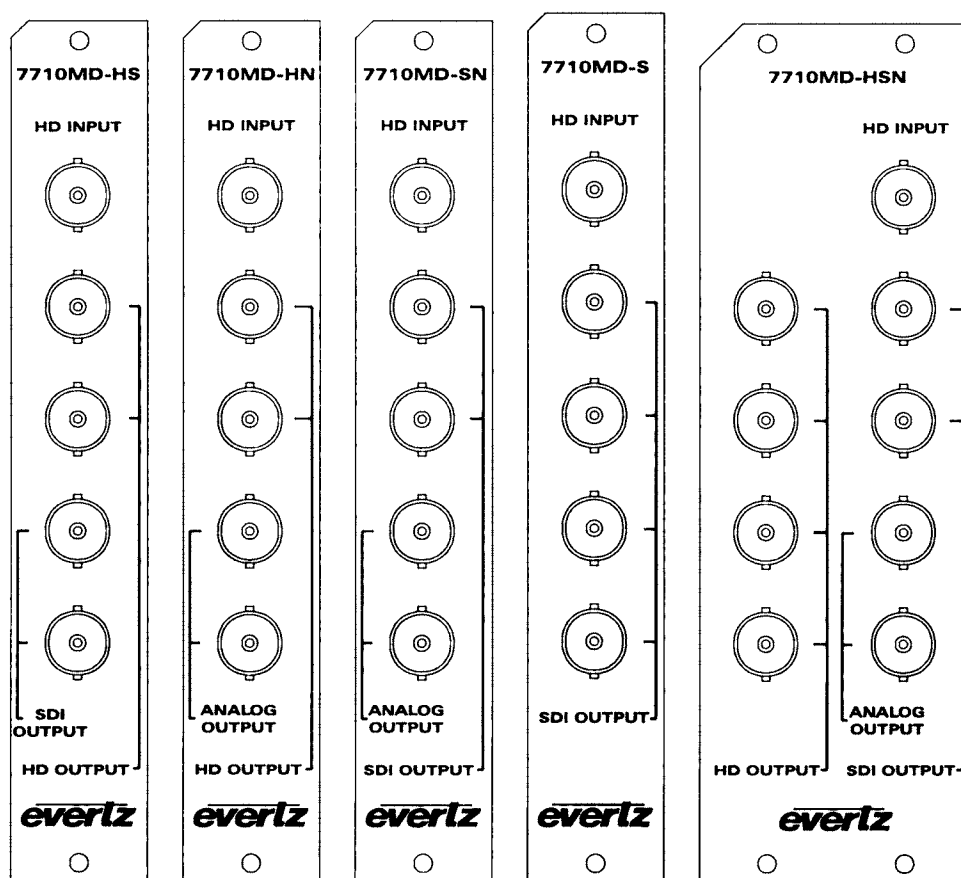
Figure 2: 7710MD Rear Panels

HD INPUT Input BNC connector for 10-bit serial digital video signals with embedded audio, compatible with the SMPTE 292M standard. The 7710MD automatically selects the video standard. See Table 1 for a list of the video standards supported.

HD OUTPUT (7710MD-HS, 7710MD-HSN and 7710MD-HN) These BNC connectors are used to output a reclocked copy of the input video, compatible with the SMPTE 292M standard.

SDI OUTPUT (7710MD-HSN, 7710MD-HS, 7710MD-S and 7710MD-SN) These BNC connectors are used to output the downconverted input video as serial component video, compatible with the SMPTE 259M standard.

ANALOG OUTPUT (7710MD-HSN, 7710MD-HN and 7710MD-SN) These BNC connectors are used to output the downconverted input video as analog composite video.

3. SPECIFICATIONS

3.1. HD SERIAL VIDEO INPUT

Standard: 1.485 Gb/sec SMPTE 292M – standards supported are shown in Table 1
Connector: 1 BNC per IEC 169-8
Equalization: Automatic to 150m @ 1.5Gb/s with Belden 1694 or equivalent cable

Common Name	Pixels / Active Lines	Frame Rate	Progressive /Interlace	SMPTE Standard
1080i/60	1920 x 1080	30	I	274M
1080i/59.94	1920 x 1080	29.97 (30/1.001)	I	274M
1080i/50	1920 x 1080	25	I	274M
1080p/24sF[1]	1920 x 1080	24	P (sF)	274M
1080p/23.98sF[1]	1920 x 1080	23.98 (24/1.001)	P (sF)	274M
720p/60	1280 x 720	60	P	296M
720p/59.94	1280 x 720	59.94 (60/1.001)	P	296M
480p/59.94[2]	720 x 483	59.94 (60/1.001)	P	293M, 349M

Table 1: Video Input Formats

[1] 1080p/24sF, 1080p/23.98sF input formats are only available with sF option installed.
[2] 480p/59.94 input formats switch selectable, others are autodetect – see section 5.4

3.2. RE-CLOCKED HD SERIAL VIDEO OUTPUTS
(7710MD-HSN, 7710MD-HS AND 7710MD-HN ONLY)

Standard: same as input - reclocked
Connectors: 2 BNC per IEC 169-8 (4 on 7710MD-HSN)
Signal Level: 800mV nominal
DC Offset: 0V ±0.5V
Rise and Fall Time: 200ps nominal
Overshoot: <10% of amplitude
Wide Band Jitter: < 0.15 UI

3.3. SDI SERIAL VIDEO OUTPUTS
(7710MD-HSN, 7710MD-HS, 7710MD-S AND 7710MD-SN ONLY)

Number of Outputs: 2 per card (4 on 7710MD-S).
Standards: serial component 270 Mb/s (SMPTE 259M)
Connectors: 2 BNC per IEC 169-8 (4 on 7710MD-S)
Signal Level: 800mV nominal
DC Offset: 0V ±0.5V
Rise and Fall Time: 200ps nominal
Overshoot: <10% of amplitude
Return Loss: > 15 dB
Wide Band Jitter: < 0.15 UI

3.4. ANALOG VIDEO OUTPUTS
(7710MD-HSN, 7710MD-HN AND 7710MD-SN ONLY)

Number of Outputs: 2 Per Card
Standards: NTSC if input is 1080i/59.94, 1080p/23.98sF[1], 480p/59.94 or 720p/59.94
Monochrome 525 if input is 1080i/60, 1080p/24sF[1] or 720p/60
PAL if input is 1080i/50, or 1080p/24sF[1]
Connectors: 2 BNC per IEC 169-8
Signal Level: 1 V p-p nominal
DC Offset: 0V ±0.1V
Return Loss: > 45 dB up to 6 MHz

[1]1080p/24sF, 1080p/23.98sF support only available with sF option installed. See section 5.3 to select between 625/PAL or 525/NTSC outputs for segmented frame inputs.

3.5. INPUT TO OUTPUT VIDEO PROCESSING DELAY

The delay between the input HD video's line 1 and the downconverted output video's line 1 is 50 lines of the SD video when the incoming and outgoing frame rate is the same. Then the incoming frame rate is 24 (23.98) there is an additional frame of delay.

Input Video	Output Video	Delay (lines)	Delay (ms)
1080i/59.94	525i/59.94	50	3.17
1080i/50	625i/50	50	3.2
1080p/23.98	525i/59.94	706	44.87
1080p/24	625i/50	701	44.86
720p/59.94	525i/59.94	50	3.17
480p/59.94	525i/59.94	50	3.17

Table 2: Input to Output Processing Delay

3.6. ELECTRICAL

Voltage:	+ 12VDC
Power:	12 watts,10 watts (7710MD-S), 14 watts (7710MD-HSN)
EMI/RFI:	Complies with FCC regulations for class A devices.
	Complies with EU EMC directive.

3.7. PHYSICAL

7700 or 7701 frame mounting:
  Number of slots: 1 (all versions except 7710MD-HSN)
                     2 (7710MD-HSN)

Stand Alone Enclosure:
  Dimensions: 14 " L x 4.5 " W x 1.9 " H
                     (355 mm L x 114 mm W x 48 mm H)
  Weight: approx. 1.5 lbs. (0.7 Kg)

4. STATUS LEDS

MODULE OK — This Green LED will be On when the module is operating properly

LOCAL FAULT — This Red LED makes it easy to identify one module in a frame that is missing an essential input or has another fault.

The LED will blink on and off if the microprocessor is not running.

The LED will be on solid when the cable length warning is active, when input video is lost or there is a fault in the module power supply.

VIDEO PRESENT: — This Green LED will be On when there is a valid video signal present at the module input.

EQ: — This Yellow LED will be On when the cable equalizer detects that the cable length is greater than a preset threshold. (Factory set for 125 meters of Belden 1694 or equivalent cable). See section 6.3 for information on adjusting the cable equalizer warning threshold.

5. CARD EDGE CONTROLS

The 7710MD is equipped with an 8 position DIP switch to allow the user to select various functions. All positions are assigned sequentially such that the DIP switch 1 is located at the top of the DIP switch (farthest from the card ejector). Table 3 gives an overview of the DIP switch functions. Sections 5.1 to 5.4 show the assigned DIP switch functions. The On position is down, or closest to the printed circuit board.

DIP Switch	Function
1	Down Converter Format Control
2	
3	Not used
4	Not used
5	NTSC Setup Pedestal Control
6	Output Format in 24sF Mode
7	Not used
8	1080i/480p Input Format Selection

Table 3: DIP Switch Functions

5.1. SELECTING THE DOWN CONVERTED FORMAT

DIP switches 1 and 2 are used to select one of four down conversion formats.

DIP 1	DIP 2	Down converted Format
Off	Off	Letter Box
On	Off	Side Cut (not supported in 720P – defaults to Letter box)
Off	On	4x3 Squeeze
On	On	Future use (defaults to Letter box)

Table 4: Down Converter Format Switch Settings

5.2. SELECTING WHETHER THE NTSC SETUP PEDESTAL IS ON

DIP switch 5 is used to select whether the 7710MD will add a 7.5 IRE Setup pedestal to the NTSC outputs. The setup pedestal should not be present when operating in Japan.

DIP 5	FUNCTION	DESCRIPTION
Off	Setup Enabled (default)	NTSC setup pedestal is enabled.
On	Setup Disabled	NTSC setup pedestal is disabled.

Table 5: NTSC Setup Switch Settings

5.3. SELECTING THE VIDEO OUTPUT FORMAT WITH 1080P/24SF VIDEO INPUT
(sF OPTION REQUIRED)

When the 7710MD is fitted with the sF option, it will downcconvert a 1080p/24sF or 1080p/23.98sF to an NTSC or PAL. DIP switch 6 is used to set the downconverted output format when the input is 1080p/24sF or 1080p/23.98sF. The 7710MD will insert extra fields of some frames to create a 3:2 or 24:25 pulldown on the output video. The relationship of the pulldown sequence to the input video will be random.

DIP 6	Input Format	Output Format

Off	1080p/24sF	525i/60 or NTSC
	1080p/23.98sF	525i/59.94 or NTSC
On	1080p/24sF	625i/50 or PAL
	1080p/23.98sF	This selection will produce an invalid output

Table 6: 1080P/24sF Output Format Switch Settings

5.4. SELECTING THE INPUT VIDEO FORMAT

The 7710MD will auto detect the input video standard for 1080I, 1080p and 720p formats and whether the input video frame rate is an integer or an integer/1.001. When 480P video formats are carried on a SMPTE 292M interface they use the same raster structure as the 1080I formats, making it impossible to auto detect the 480P video. The 7710MD uses DIP switch 8 to determine whether the input should be interpreted as 1080I or 480P.

DIP 8	FUNCTION	DESCRIPTION
Off	1080 (default)	Input video formats supported are 1080I, 1080p/sf and 720P.
On	480P	Input video formats supported are 480P and 720P.

Table 7: Input Video Switch Settings
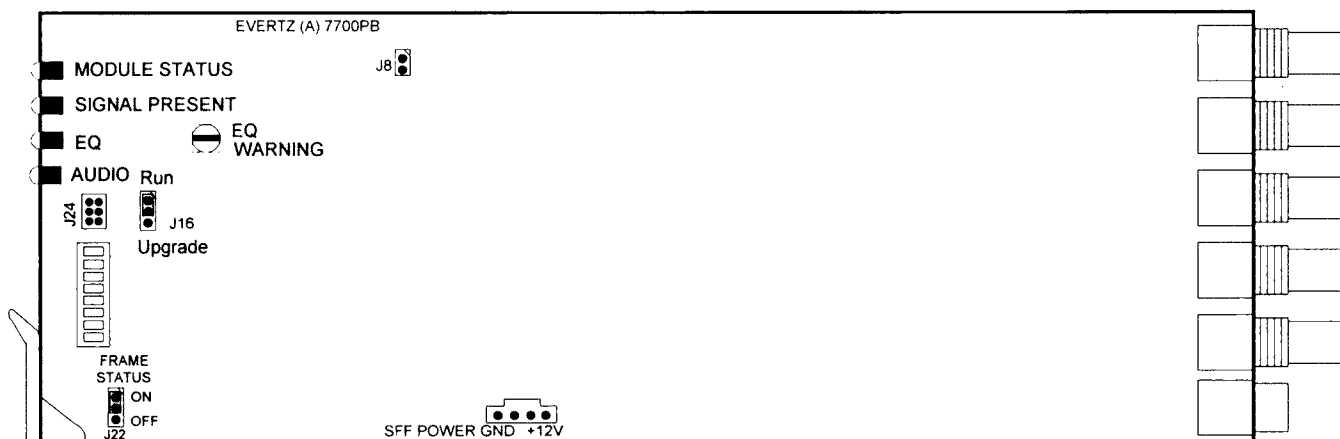
6. JUMPERS AND USER CONTROLS

Figure 3 : Location of Jumpers on Rev A 7700PB Boards

6.1. SELECTING WHETHER LOCAL FAULTS WILL BE MONITORED BY THE GLOBAL FRAME STATUS

FRAME STATUS   The FRAME STATUS jumper located at the front of the module determines whether local faults (as shown by the Local Fault indicator) will be connected to the 7700FR

frame's global status bus. (This feature is not available on Rev 1 versions of the board)

To monitor faults on this module with the frame status indicators (on the PS FRAME STATUS LED's and on the Frame's Fault Tally output) install this jumper in the On position. (Default)

When this jumper is installed in the Off position, local faults on this module will not be monitored.

6.2.   CONFIGURING THE MODULE FOR FIRMWARE UPGRADES

UPGRADE   The UPGRADE jumper J16 located at the front of the module is used when firmware upgrades are being done to the module. For normal operation it should be installed in the *RUN* position. On Rev 1 versions of this board the upgrade jumper is located in another location. See the *Upgrading Firmware* section of this manual for more information.

To upgrade the firmware in the module unit pull it out of the frame. Move Jumper J16 into the *UPGRADE* position. Install the Upgrade cable provided (located in the vinyl pouch in the front of this manual) onto header J24 at the card edge. Re-install the module into the frame. Run the upgrade as described in the *Upgrading Firmware* section of this manual. Once the upgrade is completed, remove the module from the frame, move J16 into the *RUN* position, remove the upgrade cable and re-install the module. The module is now ready for normal operation.

6.3.   SETTING THE EQUALIZER WARNING THRESHOLD

The EQ trimpot located near jumper J16 is used to set the threshold of the cable equalizer warning. The equalizer warning is factory set to 125 meters of Belden 1684 cable, but may be adjusted for other cable types or cable lengths. To adjust the cable equalizer warning threshold, connect a signal to the input of the 7710MD using the required length of cable. Adjust the trimpot slowly until the Equalizer warning LED comes on. You can verify that the equalizer warning is operating correctly by removing a few meters of cable from the input. The LED should go off.

TABLE OF CONTENTS

Figures

Tables

REVISION HISTORY

REVISION	DESCRIPTION	DATE
0.1	Preliminary Version	Sep 03
1.0	First release with VistaLINK® support, add video standard DIP switches	Oct 03
1.1	Add Genlock specifications, updated jitter specs	Oct 03
1.2	Updated delay and jitter specs	Feb 04
1.3	Added 7743DLY-HD module	Mar 04
1.3.1	Fixed Incorrect DIP switch documentation for 7743DLY-HD (Table 6-2) Fixed MODULE OK LED description	Jul 04
1.4	Updated Video Genlock Standard switch settings and Monitored Parameters	May 08

7700 MultiFrame Manual
7740DLY-HD series HD Video Delay

1.   OVERVIEW

The 7740DLY-HD series modules are full function HD Video Delay modules designed for applications such as: satellite uplink, signal re-entry on master control inputs, at cable headends, mobile vehicle outputs, broadcast transmitter inputs, virtual sets and matching delays caused by multi-channel audio compression.

There are two models available with different amounts of delay possible. The 7743DLY-HD also can act as a delay for standard definition SMPTE 259M video. Both versions will be referred to as the 7740DLY-HD throughout this manual except where there are specific differences in the products.

Model	Video Standard	Delay Range
7742DLY-HD (Discontinued)	HD SDI (SMPTE 292M)	37 µs up to 1.6 seconds
7743DLY-HD	SDI (SMPTE 259M)	65 µs up to 16.5 seconds
	HD SDI (SMPTE 292M)	37 µs up to 3.3 seconds

> **As of July 2004 the 7742DLY-HD has been discontinued, but the documentation is included here for customers with existing units.**

The 7740DLY-HD modules will delay all VBI and Ancillary data including embedded audio along with the video. The delay can be set in frames, lines and samples or in seconds.

With the broadcast environment in mind, the modules feature bypass relay protection to one output.
The 7740DLY-HD modules are housed in a 3RU frame that will hold up to seven 7740DLY-HD series modules or a 1RU frame that will hold up to 3 modules.

Features:
- Full signal delay capability including VBI and ANC DATA for SMPTE 292M (1.5Gb/s) signals
- 7743DLY-HD also supports full signal delay capability including VBI for SMPTE 259M (270Mb/s) signals
- Delay programmable in video units (frames, lines, and samples) or as time units (seconds)
- Auto senses video standard
- Bypass relay for program path protection on power loss
- Card edge controls operate on screen menu system to program delay settings
- VistaLINK® - enabled offering remote control and configuration capabilities via SNMP using VistaLINK® Pro or 9000NCP Network Control Panel. VistaLINK® is available when modules are used with the 3RU 7700FR-C frame and a 7700FC VistaLINK® Frame Controller module in slot 1 of the frame

Revision 1.4   **7740DLY-HD - 1**

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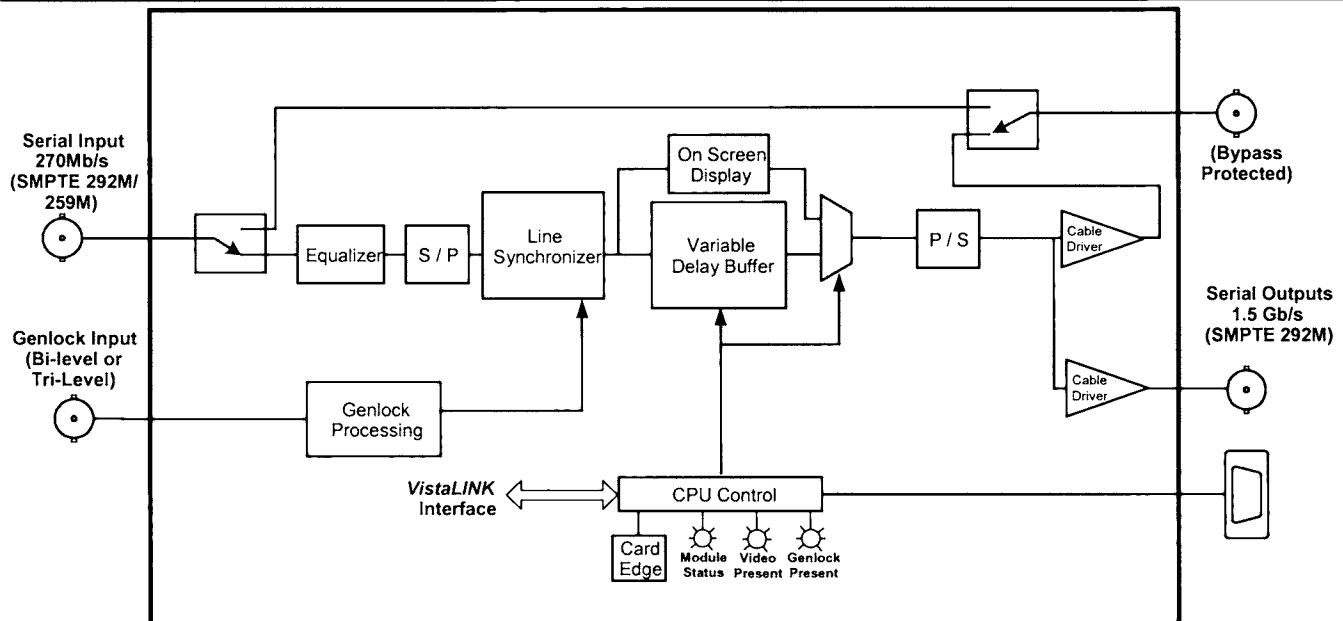
Figure 1-1: 7740DLY-HD Series Block Diagram

2. INSTALLATION

The 7740DLY-HD series modules come with a companion rear plate that has 4 BNC connectors and a 25 pin D connector and occupy two slots in the frame. For information on mounting the rear plate and inserting the module into the frame see the 7700FR chapter section 3.
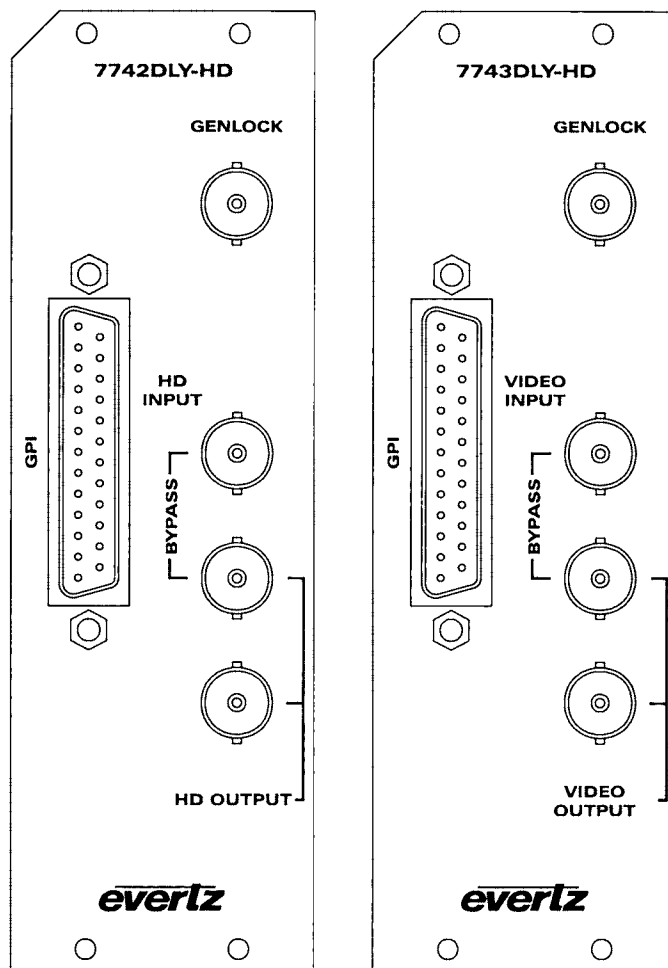
Figure 2-1: 7740DLY-HD Series Rear Panels

2.1. VIDEO CONNECTIONS

HD INPUT(VIDEO INPUT): Input BNC connector for 10-bit serial digital video signals. The 7742DLY-HD supports signals compatible with the SMPTE 292M (1.5 Gb/s) standard. The 7743DLY-HD supports signals compatible with the SMPTE 259M (270 Mb/s) and SMPTE 292M (1.5 Gb/s) standards.

HDI OUTPUT (VIDEO OUTPUT): Two BNC serial digital video outputs are provided. Output 1 is protected by a bypass relay, which will activate in the event of power loss to the module. The remaining output is not bypass protected.

2.2. GENLOCK REFERENCE

GENLOCK: This BNC is used to connect a video or tri-level sync reference. The genlock signal may be NTSC or PAL colour black, or tri-level sync and is auto-detected by the module. The genlock standard must be set using the DIP switches 1 to 3. (See section 5.1) Jumper J9 on the 7700CC sub-module selects whether the reference input is terminated to 75 ohms or high impedance (default). (See section 8.3). The output video can be timed with respect to the genlock video using the *Reference Phase* menu items. (See section 7.2.1) When no Genlock is provided, the output video is timed with respect to the input video. In order to meet the jitter tolerance specifications outlined in section 3.2 a genlock reference must be applied.

2.3. GENERAL PURPOSE INPUTS

A 25 pin D connector labeled GPI contains 8 GPI inputs. The connector pinout is shown in Table 2-1.

Pin #	Name	Description
1	-	Not used
2	-	Not used
3	GPI 0	Bypass Relay Enable
4	GPI 1	Future use
5	-	Not used
6	-	Not used
7	-	Not used
8	-	Not used
9	-	Not used
10	-	Not used
11	GPI 2	Future use
12	GPI 3	Future use
13	GPI 4	Future use
14	GPI 6	Future use
15	GPI 7	Future use
16	-	Not used
17	-	Not used
18	-	Not used
19	-	Not used
20	-	Not used
21	GND	Ground
22	-	Not used
23	-	Not used
24	-	Not used
25	GPI 5	Future use
	Shell	Ground

Table 2-1: GPI Connector Pin Definitions

3. SPECIFICATIONS

3.1. SERIAL VIDEO INPUT

3.1.1. High Definition Serial Digital Video

Standard:	SMPTE 292M (1.5 Gb/s)
Connector:	BNC per IEC 60169-8 Amendment 2.
Equalization:	Automatic to 75m @ 1.5 Gb/s with Belden 1694 or equivalent cable
Return Loss:	> 15 dB up to 1.0 Gb/s
	> 10 dB up to 1.5 Gb/s (with relay)

3.1.2. Standard Definition Serial Digital Video (model 7743DLY-HD only)

Standard:	SMPTE 259M (270 Mb/s)
Connector:	BNC per IEC 60169-8 Amendment 2.
Equalization:	Automatic
Max. Cable Length:	Automatic to 300m @ 270 Mb/s with Belden 8281 or equivalent cable
Return Loss:	> 15 dB up to 270 Mb/s

3.2. SERIAL VIDEO OUTPUTS

3.2.1. HD Serial Digital Video

Number of Outputs:	1 with relay bypass, 1 additional output.
Connector:	BNC per IEC 60169-8 Amendment 2.
Signal Level:	800mV nominal
DC Offset:	0V ±0.5V
Rise and Fall Time:	200ps nominal
Overshoot:	<10% of amplitude
Return Loss:	> 15 dB up to 1.5 Gb/s
Wide Band Jitter:	< 0.2 UI

3.2.2. Standard Definition Serial Digital Video (model 7743DLY-HD only)

Number of Outputs:	1 with relay bypass, 3 additional outputs.
Connector:	BNC per IEC 60169-8 Amendment 2.
Signal Level:	800mV nominal
DC Offset:	0V ±0.5V
Rise and Fall Time:	740ps nominal
Overshoot:	<10% of amplitude
Return Loss:	> 15 dB up to 540 Mb/s
Wide Band Jitter:	< 0.2 UI

3.3.   GENLOCK INPUT

Type: HD Tri-level Sync, (See Table 5-2)
                        NTSC or PAL Colour Black 1 V p-p, or
                        Composite bi-level sync (525i/59.94 or 625i/50) 300 mV
Connector: BNC per IEC 60169-8 Amendment 2.
Termination: 75 ohm (jumper selectable)

3.4.   FUNCTIONAL

Minimum Delay:
    7742DLY-HD: 37.7 μsec (2800 samples)
    7743DLY-HD: 65.5 μsec (1770 samples) for standard definition,
                        37.7 μsec (2800 samples) for high definition
Maximum Delay:
    7742DLY-HD: approx. 1.67 sec
    7743DLY-HD: approx. 16.5 sec for standard definition
                        approx. 3.2 sec for high definition

3.5.   ELECTRICAL

Voltage: + 12VDC
Power: 20 watts
EMI/RFI: Complies with FCC regulations for class A devices.
                        Complies with EU EMC directive.

3.6.   PHYSICAL

7700 frame mounting:
  Number of slots: 2

7701 frame mounting:
  Number of slots: 1

Stand Alone Enclosure:
  Dimensions: 14 " L x 4.5 " W x 1.9 " H
                        (355 mm L x 114 mm W x 48 mm H)
  Weight: approx. 1.5 lbs. (0.7 Kg)

4. STATUS LEDS

The 7740DLY-HD has 2 LED Status indicators on the main circuit board and 2 indicators on the sub-module to show operational status of the card at a glance. Figure 8-1 and Figure 8-2 show the location of the LEDs and card edge controls.

Two large LEDS on the front of the main board indicate the general health of the module:

LOCAL FAULT: This Red LED indicates poor module health and will be On during the absence of a valid input signal or if a local input power fault exists (i.e.: a blown fuse). The LOCAL FAULT indication can also be reported to the frame through the FRAME STATUS jumper.

MODULE OK: This Green LED indicates good module health. It will be On when the board power is good and the module is running normally.

Two LEDs on the sub-module (7700CC) indicate the presence of the video input and genlock signals.

VIDEO PRESENT: This Green LED will be ON when there is a valid video signal present at the module input.

GENLOCK: This Green LED will be ON when there is a signal present at the module genlock input. This LED does not indicate that a correct signal appropriate for the current video format is present. Refer to Table 5-2 for valid Video format and input Genlock combinations.

5. CARD EDGE CONTROLS- 7742DLY-HD

The 7742DLY-HD module is equipped with a 4 position DIP switch on the top edge of the card to allow the user to select various functions. All positions are assigned sequentially such that the DIP switch 1 is located farthest from the front of the card. Table 5-1 gives an overview of the DIP switch functions for the 7742DLY-HD. Sections 5.1 and 5.2 describe the assigned DIP switch functions. The On (closed) position is down, or closest to the printed circuit board. The Off (open) position is up, or farthest from the printed circuit board. There is also a toggle switch and pushbutton which are used to navigate the on screen menu. (See section 7)

DIP Switch	Function
1	
2	Video / Genlock Standard
3	
4	VistaLINK® Control Enable

Table 5-1: Overview of DIP Switch Functions – 7742DLY-HD

5.1. SELECTING THE VIDEO AND GENLOCK STANDARD – 7742DLY-HD

DIP switches 1, 2 and 3 are used to select the video and genlock standard when there is a genlock signal applied (as shown in Table 5-2). When there is no genlock signal connected, the 7740DLY-HD will auto-detect the video standard in use.

				Valid Genlock Types	
DIP 1	DIP 2	DIP 3	Video Format	Bi-Level	Tri-Level
Off	Off	Off	1080i/59.94 1080p/29.97 1080p/29.97sF 1035i/59.94	525/59.94	1080i/59.94 1080p/29.97 1080p/29.97sF 1035i/59.94
Off	Off	On	1080i/60 1080p/30 1080p/30sF 1035i/60	525/60	1080i/60 1080p/30 1080p/30sF 1035i/60
Off	On	Off	720p/59.94	525/59.94	720p/59.94
Off	On	On	720p/60	525/60	720p/60
On	Off	Off	1080i/50 1080p/25 1080p/25sF	625/50	1080i/50 1080p/25 1080p/25sF
On	Off	On	1080p/23.98 1080p/23.98sF		1080p/23.98 1080p/23.98sF
On	On	Off	1080p/24 1080p/24sF		1080p/24 1080p/24sF
On	On	On	Future use		

Table 5-2: Video and Genlock Standard Switch Settings – 7742DLY-HD

5.2. SELECTING WHETHER MODULE WILL BE CONTROLLED FROM THE LOCAL CONTROLS OR THROUGH THE *VISTA*LINK® INTERFACE – 7742DLY-HD

DIP switch 4 selects whether the module will be controlled from the local user controls or through the *Vista*LINK® interface.

DIP 4	VISTALINK CONTROL
Off	The card functions are controlled through the local menus
On	The card functions are controlled through the *Vista*LINK® interface. (See section 9)

Table 5-3: VistaLINK® Control Switch Settings – 7742DLY-HD

6. CARD EDGE CONTROLS – 7743DLY-HD

The 7743DLY-HD module is equipped with a 4 position DIP switch on the top edge of the card to allow the user to select various functions. Table 6-1 gives an overview of the DIP switch functions for the 7742DLY-HD. All positions are assigned sequentially such that the DIP switch 1 is located farthest from the front of the card. Sections 6.1 and 6.2 describe the assigned DIP switch functions. The On (closed) position is down, or closest to the printed circuit board. The Off (open) position is up, or farthest from the printed circuit board. There is also a toggle switch and pushbutton which are used to navigate the on screen menu. (See section 7)

DIP Switch	Function
1	
2	Video / Genlock Standard &
3	VistaLINK® Control Enable
4	

Table 6-1: Overview of DIP Switch Functions – 7743DLY-HD

6.1. SELECTING THE VIDEO AND GENLOCK STANDARD – 7743DLY-HD

DIP switches 1, 2, 3 and 4 are used to select the video and genlock standard when there is a genlock signal applied (as shown in Table 5-2). When there is no genlock signal connected, the 7743DLY-HD will auto-detect the video standard in use.

| DIP 1 | DIP 2 | DIP 3 | DIP 4 | Video Format | Valid Genlock Types | |
					Bi-Level	Tri-Level
Off	Off	Off	Off	1080i/59.94 1080p/29.97 1080p/29.97sF 1035i/59.94	525i/59.94	1080i/59.94 1080p/29.97 1080p/29.97sF 1035i/59.94
Off	Off	Off	On	1080i/60 1080p/30 1080p/30sF 1035i/60	525i/60	1080i/60 1080p/30 1080p/30sF 1035i/60
Off	Off	On	Off	720p/59.94	525i/59.94	720p/59.94
Off	Off	On	On	720p/60	525i/60	720p/60
Off	On	Off	Off	1080i/50 1080p/25 1080p/25sF	625i/50	1080i/50 1080p/25 1080p/25sF
Off	On	Off	On	1080p/23.98 1080p/23.98sF		1080p/23.98 1080p/23.98sF
Off	On	On	Off	1080p/24 1080p/24sF		1080p/24 1080p/24sF
Off	On	On	On	525/59.94	525i/59.94	
On	Off	Off	Off	625i/50	625i/50	
On	Off	Off	On	720p/50	625i/50	720p/50
On	On	On	Off	Auto-detect		
On	On	On	On	Future use		

Table 6-2: Video and Genlock Standard Switch Settings – 7743DLY-HD

6.2. SELECTING WHETHER THE MODULE WILL BE CONTROLLED FROM THE LOCAL CONTROLS OR THROUGH THE VISTALINK® INTERFACE – 7743DLY-HD

When all four DIP switches are On the module will be controlled through the VistaLINK® interface. Otherwise it will be controlled through the local interface.

DIP 1	DIP 2	DIP 3	DIP 4	VISTALINK® CONTROL
On	On	On	On	The card functions are controlled through the VistaLINK® interface. (See section 9)

Table 6-3: VistaLINK® Control Switch Settings – 7743DLY-HD

7. USING THE ON SCREEN MENU

An On screen menu (OSD) is used to configure many of the module's parameters. The three position, return to center, toggle switch and momentary pushbutton located on the front edge of the module are used to navigate the OSD setup menus and configure the card's various controls.

To enter the OSD menu system, press and hold the pushbutton and then press the toggle switch up for 3 seconds. This will bring you to the main setup menu where you can use the toggle switch to move up and down the list of available sub-menus. An arrow (>) moves up and down the left hand side of the menu items to indicate which item you are currently choosing. Once the arrow is on the desired item, press the pushbutton to select the next menu.

On all menus, there is a selectable item *Done*. Selecting *Done* will take you to the previous menu (the one that was used to get into the menu). If you are at the top level of the menu tree then selecting *Done* will exit the OSD menu and return the module to the normal operating mode.

Once you are in a sub-menu, there may be another menu level, or there may be a list of parameters to adjust. If there is another set of menu choices, use the toggle switch to select the next option with the same procedure as in the main menu.

If there is a list of parameters to adjust, use the toggle switch to move up or down to the desired parameter and press the pushbutton. The arrow will move to the right hand side (<) indicating that you can now adjust the parameter. Using the toggle switch, adjust the parameter to its desired value. If the parameter is a numerical value, the number will increase if you lift the toggle switch and decrease if you push down on the toggle switch. If the parameter contains a list of choices, you can cycle through the list by pressing the toggle switch in either direction.

When you have stopped at the desired value, depress the pushbutton. This will update the parameter with the selected value and move the arrow back to the left side of the parameter list. Continue selecting and adjusting other parameters or use the *Done* commands to return to the next higher menu level.

7.1. TOP LEVEL MENU STRUCTURE

The following is a brief description of the top level of the menu tree that appears when you enter the On screen menu. Selecting one of these items will take you down into the next menu level.

VIDEO DELAY	Sets the amount of delay.
REFERENCE PHASE	Sets the timing phase of output video to the Genlock reference input.
DONE	Exit On Screen Menu System.

7.1.1. Setting the Video Delay

The *VIDEO DELAY* menu item allows the user to set the video delay. The maximum delay is approximately 1.6 seconds even though it is set using video units (frames, lines and samples). The video delay is set using frame, line or sample increments. Each time the pushbutton is pressed to accept a portion of the total delay, the new video delay will be implemented.

Frame = xxx	Sets the amount of delay in whole numbers of frames
Line = yyy	Sets the amount of delay in whole numbers of lines (the sub-frame)
Sample = zzz	Sets the amount of delay in samples (the sub-line delay)
Done	Return to main menu
Delay = ttt.ddd sec	Displays the amount of delay in seconds

Step 1: Coarse Adjustment

Press the toggle switch up or down until the right arrow (>) is beside the Frames menu item. Press the pushbutton to set the whole frame delay. The display will show `frames = xxx` where xxx is the frames part of the delay value. Press the toggle switch up or down to adjust the value. Holding the toggle switch will change the value at a faster rate. Press the pushbutton to accept the video frames part of the delay. The arrow (>) will appear back at the left side of the display.

Step 2: Medium Adjustment

Press the toggle switch down until the right arrow (>) is beside the Lines menu item. Press the pushbutton to set the whole line delay. The display will show `line = yyy` where yyy is the lines part of the delay value. Press the toggle switch up or down to adjust the value. Holding the toggle switch will change the value at a faster rate. Press the pushbutton to accept the video lines part of the delay. The arrow (>) will appear back at the left side of the display.

Step 3: Fine Adjustment

Press the toggle switch down until the right arrow (>) is beside the Samples menu item. Press the pushbutton to set the sample delay. The display will show `sample = zzz` where zzz is the samples part of the delay value. Press the toggle switch up or down to adjust the value. Holding the toggle switch will change the value at a faster rate. Press the pushbutton to accept the video sample part of the delay. The arrow (>) will appear back at the left side of the display.

Table 7-1 shows the maximum number of video units of delay available for different HD video standards with the 7742DLY-HD. Table 7-2 shows the maximum number of video units of delay available for different HD video standards with the 7743DLY-HD. The calculations are based on the total samples per line shown in Table 7-1 and Table 7-2, and the time per sample which is $1 / (74.25 \times 10^6)$ seconds. Table 7-5 shows typical conversions between video units and time units for 525 and 625 line video.

Table 7-3 shows the maximum number of video units of delay available for different SD video standards with the 7743DLY-HD. The calculations are based on the total samples per line shown in Table 7-3, and the time per sample which is $1 / (13.5 \times 10^6)$ seconds. Table 7-4 shows typical conversions between video units and time units for 525 and 625 line video.

Video Type	Lines per frame	Samples per line	Maximum delay			
			Video Units			Time Units
			Frames	Lines	Samples	Seconds
1080i/60	1125	2200	49	1124	2199	1.667
1080i/50	1125	2640	40	1124	2639	1.640
1080p/24	1125	2750	39	1124	2749	1.667
720p/60	750	1650	97	749	1649	1.633

Table 7-1: Maximum HD Video Delay – 7742DLY-HD

Video Type	Lines per frame	Samples per line	Maximum delay			
			Video Units			Time Units
			Frames	Lines	Samples	Seconds
1080i/60	1125	2200	101	1124	2199	3.378
1080i/50	1125	2640	83	1124	2639	3.399
1080p/24	1125	2750	80	1124	2749	3.359
720p/60	750	1650	197	749	1649	3.3033

Table 7-2: Maximum HD Video Delay – 7743DLY-HD

Video Type	Lines per frame	Samples per line	Maximum delay			
			Video Units			Time Units
			Frames	Lines	Samples	Seconds
525	525	1716	494	524	1716	16.5165
625	625	1728	414	625	1728	16.600

Table 7-3: Maximum SD Video Delay – 7743DLY-HD

Video Type	Desired Delay		Video Units		
	Milliseconds	Total Samples	Frames	Lines	Samples
525	50	1,350,000	1	261	1224
	100	2,700,000	2	523	732
	200	5,400,000	5	521	1464
625	50	1,350,000	1	156	432
	100	2,700,000	2	313	239
	200	5,400,000	5	1	478

Table 7-4: Typical SD Video Delay Settings

Video Type	Desired Delay		Video Units		
	Milliseconds	Total Samples	Frames	Lines	Samples
1080i/60	50	3,712,500	1	562	1100
	100	7,425,000	3	0	0
	200	14,850,000	6	0	0
1080i/50	50	3,712,500	1	281	660
	100	7,425,000	2	562	1320
	200	14,850,000	5	5	0
1080p/24	50	3,712,500	1	225	0
	100	7,425,000	2	450	0
	200	14,850,000	4	900	0
720p/60	50	3,712,500	3	0	0
	100	7,425,000	6	0	0
	200	14,850,000	12	0	0

Table 7-5: Typical HD Video Delay Settings

7.2. CONFIGURING THE VIDEO OUTPUT PHASE

The *Reference Phase* menus are used to the output video timing. The chart below shows the items available in the *Reference Phase* menu. Sections 7.2.1.1 to 7.2.1.2 give detailed information about each of the menu items.

V
H

Sets the vertical phase of the output signal to the genlock reference input

Sets the horizontal phase of the output signal to the genlock reference input

7.2.1. Setting up the Video Output Timing

The output stage of the 7740DLY-HD contains a frame buffer and a line buffer so that the output video can be timed with respect to the reference applied to the **GENLOCK** input BNC. In the absence of a genlock signal the output video will be timed with respect to the incoming Video.

> ⚠️ **The *V* and *H* phase adjustments are REAL TIME ADJUSTMENTS and will affect the output video timing immediately. These settings should not be adjusted when the output video is in the broadcast chain.**

7.2.1.1. Setting the Vertical Phase of the Output Video

Reference Phase
V
1 to Max Lines
1

With this control, you can set the vertical timing of the output video with respect to the genlock reference input. There are separate settings of V phase offset for each output video type. Setting this control to 1 keeps the output video in time with the Genlock reference or incoming video if genlock is missing.

Increasing the value will delay the output video in one-line increments of the output video standard. In order to advance the vertical timing of the output video with respect to the genlock video, set the control to the maximum total number of lines of the output video minus the number of lines that you wish to advance the output video. (E.g. for 1080i/59.94 output video the total number of lines is 1125, so to advance the output video 5 lines set the value to 1120.) If increasing the *V Phase Offset* value causes it to go beyond the limit of the frame buffer, the *V Phase Offset* will wrap to the beginning of the frame buffer, resulting in a change of one frame of throughput delay between the video input and the video output.

7.2.1.2. Setting the Horizontal Phase of the Output Video

Reference Phase
H
0 to Max samples
0

With this control, you can set the horizontal timing of the output video with respect to the genlock reference input. There are separate settings of V phase offset for each output video type. Setting this control to 0 keeps the output video in time with the Genlock reference.

Increasing the value will delay the output video in one-sample increments. In order to advance the horizontal timing of the output video with respect to the genlock video, set the control to the maximum number of samples per line for the output video standard minus the number of samples that you wish to advance the output video. (E.g. for 1080i/59.94 output video the total number of samples per line is 2200, so to advance the output video 5 samples set the value to 2195.)

8. JUMPERS AND USER CONTROLS
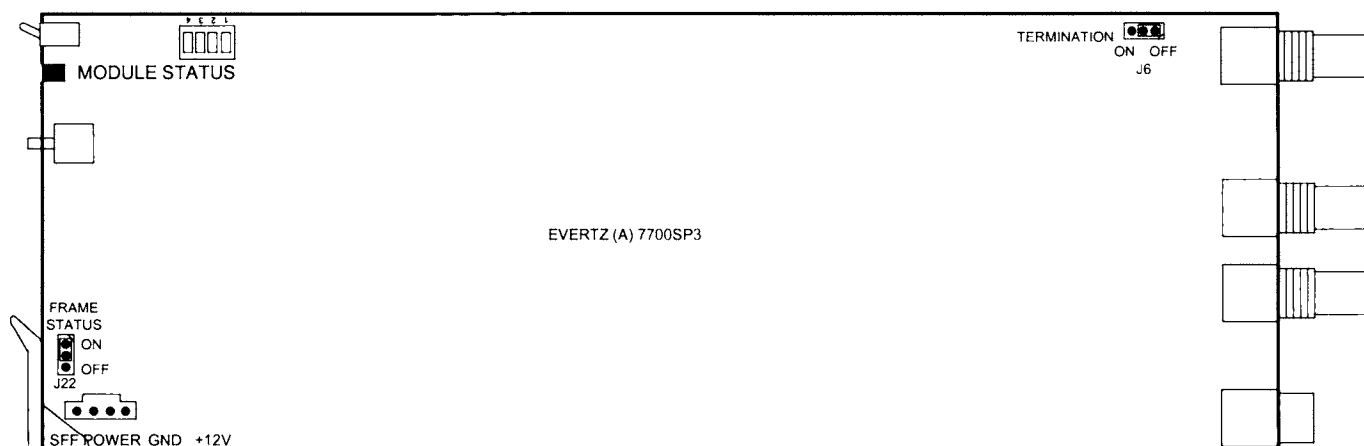
Figure 8-1: Location of Jumpers on Main Boards
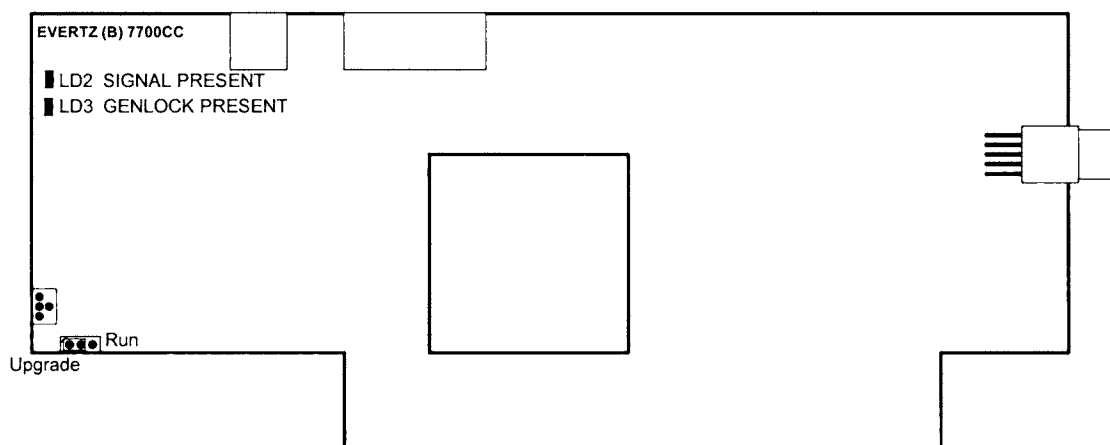
Figure 8-2: Location of Jumpers on 7700CC Sub Module

8.1. SELECTING WHETHER LOCAL FAULTS WILL BE MONITORED BY THE GLOBAL FRAME STATUS

FRAME STATUS: The FRAME STATUS jumper J22 located at the front of the main module determines whether local faults (as shown by the Local Fault indicator) will be connected to the 7700FR frame's global status bus.

To monitor faults on this module with the frame status indicators (on the PS FRAME STATUS LED's and on the Frame's Fault Tally output) install this jumper in the On position. (Default)

When this jumper is installed in the Off position, local faults on this module will not be monitored.

8.2. CONFIGURING THE MODULE FOR FIRMWARE UPGRADES

UPGRADE: The UPGRADE jumper J16 located at the front of the main module is used when firmware upgrades are being done to the module. For normal operation it should be installed in the *RUN* position. See the *Upgrading Firmware* chapter in the front of the binder for more information.

To upgrade the firmware in the module unit pull it out of the frame. Move Jumper J16 into the *UPGRADE* position. Install the Upgrade cable provided (located in the vinyl pouch in the front of this manual) onto header J24 at the card edge. Re-install the module into the frame. Run the upgrade as described in *Upgrading Firmware* chapter. Once the upgrade is complete, remove the module from the frame, move J16 into the *RUN* position, remove the upgrade cable and re-install the module. The module is now ready for normal operation.

8.3. SELECTING WHETHER THE GENLOCK REFERENCE INPUT IS TERMINATED

TERM: The TERM jumper J9 located at the rear of the APB3FMTCON sub-module is used to terminate the genlock loop input. Then it is in the 75R position a 75 ohm terminating resistor will connect the input to ground. When it is in the HI-Z position the genlock loop input will be high impedance.

9.   *VISTA*LINK® REMOTE MONITORING/CONTROL

9.1.   WHAT IS *VISTA*LINK®?

VistaLINK® is Evertz's remote monitoring and configuration platform which operates over an Ethernet network using Simple Network Management Protocol (SNMP). SNMP is a standard computer network protocol that enables different devices sharing the same network to communicate with each other. VistaLINK® provides centralized alarm management, which monitors, reports, and logs all incoming alarm events and dispatches alerts to all the VLPro Clients connected to the server. Card configuration through VistaLINK® PRO can be performed on an individual or multi-card basis using simple copy and paste routines, which reduces the time to configure each module separately. Finally, VistaLINK® enables the user to configure devices in the network from a central station and receive feedback that the configuration has been carried out.

There are 3 components of SNMP:

1. An SNMP manager, also known as a Network Management System (NMS), is a computer running special software that communicates with the devices in the network. Evertz *Vista*LINK® Pro Manager graphical user interface (GUI), third party or custom manager software may be used to monitor and control Evertz *Vista*LINK® enabled fiber optic products.

2. Managed devices (such as 7707MB), each with a unique address (OID), communicate with the NMS through an SNMP Agent. Evertz VistaLINK® enabled 7700 series modules reside in the 3RU 7700FR-C MultiFrame and communicate with the manager via the 7700FC VistaLINK® frame controller module, which serves as the Agent.

3. A virtual database, known as the Management Information Base (MIB) lists all the variables being monitored, which both the Manager and Agent understand. Please contact Evertz for further information about obtaining a copy of the MIB for interfacing to a third party Manager/NMS.

For more information on connecting and configuring the *Vista*LINK® network, see the 7700FC Frame Controller chapter.

9.2.   *VISTA*LINK® MONITORED PARAMETERS

The following parameters can be remotely monitored through the *Vista*LINK® interface.

Parameter	Description
Module Status	Indicates good module health and the presence of a valid video input signal. (The state of the MODULE OK LED)
Input Video Present	Indicates the presence of a valid video input signal. (The state of the VIDEO PRESENT LED)
Input Video Standard	Indicates video standard of input signal
Gen Lock Present	Indicates the presence of a valid genlock reference signal. (The state of the GENLOCK LED)
Local Remote Mode	Indicates whether the 7740DLY-HD is under local control or VistaLINK® control. (The state of DIP switch 4)
Total Delay (frames)	Indicates the frames of the total delay being applied to the video
Total Delay (lines)	Indicates the partial frames of total delay being applied to the video (expressed as lines)
Total Delay (samples)	Indicates the partial lines of total delay being applied to the video (expressed as samples)
Total Delay (time)	Indicates the current delay through line buffer when Genlock signal is applied (expressed as microseconds)

Table 9-1: *Vista*LINK® Monitored Parameters

9.3.   *VISTA*LINK® CONTROLLED PARAMETERS

Parameter	Description
Gen Lock Standard	Sets video standard of genlock reference signal. When DIP switch 4 is Off indicates the state of DIP switches 1 to 3
V Phase Offset	Vertical phase offset from Genlock reference
H Phase Offset	Horizontal phase offset from Genlock reference
Video Delay (frames)	Whole frames of delay being added to the video
Video Delay (lines)	Whole lines of delay being added to the video
Video Delay (samples)	Partial lines of delay (i.e. samples) being added to the video

Table 9-2: *Vista*LINK® Controlled Parameters

9.4. *VISTA*LINK® TRAPS

The following traps can be controlled through the *Vista*LINK® interface. Each trap will indicate a fault condition when its value is True.

Trap	Description for True Condition
ModuleStatus	Local Fault LED is On
VideoPresent	No input video present (VIDEO PRESENT LED is Off)
GenlockPresent	No genlock present (GENLOCK PRESENT LED is Off)
InvalidVideoStandard	Input signal has an unsupported Video Standard

Table 9-3: *Vista*LINK® Traps

TABLE OF CONTENTS

Figures

REVISION HISTORY

REVISION	DESCRIPTION	DATE
1.0	Original Version	June 99
1.1	Added drawings to show location of jumpers	Aug 99
1.2	Added section on adjusting the EQ threshold, Bypass mode now called non-reclock mode, Figures 1,3,4 updated	Sept 99
1.3	Added information on 7700DA8-HD 8 output DA, Added jumper locations for Rev C board (Figure 5 added) Specifications updated	July 00

1. OVERVIEW

The 7700DA-HD Distribution Amplifier provides an economical method of distribution for your SMPTE 292M (1.5 Gb/s) HDTV serial digital signals. The 7700DA-HD has been designed to be used primarily as a reclocking 1.5Gb/s distribution amplifier, however, it can also be used as a non-reclocking SMPTE 310M (19.4 Mb/s, or 45 Mb/s), DVB-ASI, or SMPTE 259M(143 to 540 Mb/s) distribution product. The DA's come in two versions.

Model	Total Outputs	DVB-ASI Compatible Outputs	Slots
7700DA-HD	4	4	1
7700DA8-HD	8	6	2

Features:

- Reclocking mode for SMPTE 292M (1.5 Gb/s) signals
- Non-reclock mode for SMPTE 310M (nominal 19.4 Mb/s), SMPTE 259M (143 to 540 Mb/s) or DVB-ASI, or any other bit rate less than 1.5 Gb/s
- Fully hot-swappable from front of frame with no BNC disconnect required
- Polarity maintained from input to output for DVB-ASI applications (only outputs 1,2,3,4,5 and 7 on 7700DA8-HD)
- Automatic cable equalization to 130 m
- Tally output on Frame Status bus upon loss of input signal
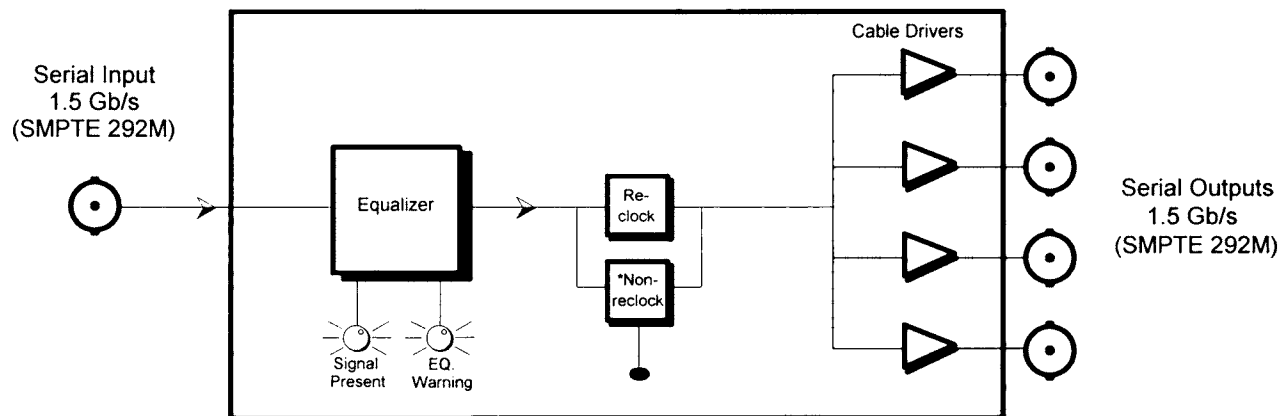
*Note: Non-reclock Mode will operate 19.4 Mb/s to 1.5 Gb/s.

Figure 1: 7700DA-HD Block Diagram

2. INSTALLATION

The 7700DA-HD comes with a companion rear plate that has 5 BNC connectors. The 7700A10-HD comes with a companion rear plate that has 9 BNC connectors and occupies two slots in the frame. For information on mounting the rear plate and inserting the module into the frame see the 7700FR chapter section 3.
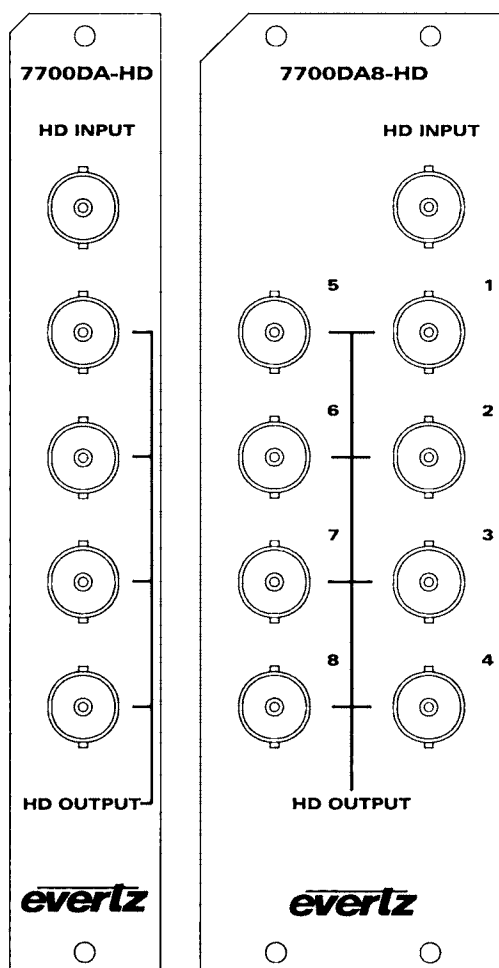
Figure 2: Rear Panels

HD INPUT Input BNC connector for 10-bit serial digital video signals compatible with the SMPTE 292M standard.

HD OUTPUT 7700DA-HD: There are four BNC connectors with reclocked serial component video outputs, compatible with the SMPTE 292M standard. All outputs maintain the same polarity as the input and are DVB-ASI compliant in non-reclock mode.

7700DA8-HD: There are eight BNC connectors with reclocked serial component video outputs, compatible with the SMPTE 292M standard. Outputs 1, 2, 3, 4, 5 and 7 maintain the same polarity as the input and are DVB-ASI compliant in non-reclock mode.

3.   SPECIFICATIONS

3.1.   SERIAL VIDEO INPUT:

Standards:
  Normal: SMPTE 292M
  Non-Reclock Mode: SMPTE 310M (MPEGTX 19.4 & 40Mb/s) or
                            SMPTE 259M A, B, C, D,
                            DVB-ASI or any other bit rate less than 1.5 Gb/s
Connector: 1 BNC per IEC 169-8
Equalization: Automatic 130m @ 1.5Gb/s with Belden 1694 or equivalent cable
Return Loss: > 15 dB up to 1 Gb/s, > 12 dB up to 1.5 Gb/s

3.2.   SERIAL VIDEO OUTPUTS:

Number of Outputs: 4 Per Card. (7700DA-HD, all outputs 1, 2, 3, 4, 5 and 7 are DVB-ASI compliant
                        8 per card (7700DA8-HD) outputs 1, 2, 3, 4, 5 and 7 are DVB-ASI compliant
Standards: same as input
Connectors: BNC per IEC 169-8
Signal Level: 800mV nominal
DC Offset: 0V ±0.5V
Rise and Fall Time: 200ps nominal
Overshoot: <10% of amplitude
Return Loss: > 15 dB up to 1 Gb/s, > 12 dB up to 1.5 Gb/s
Wide Band Jitter: < 0.15 UI (reclocked)

3.3.   ELECTRICAL

Voltage: + 12VDC
Power: 5 Watts.
EMI/RFI: Complies with FCC regulations for class A devices.
                    Complies with EU EMC directive.

4.   STATUS LEDS

MODULE OK   This Green LED will be On when the module is operating properly

LOCAL FAULT   This Red LED will be On when input video is lost or when there is a fault in the module power supply.

CARRIER PRESENT: This Green LED will be On when there is a valid signal present at the module input.

CABLE LENGTH WARNING: This Yellow LED will be On when the cable equalizer detects that the cable length is greater than a preset threshold. (factory set for 125 meters of Belden 1694 or equivalent cable). See section 5.3 for information on adjusting the cable equalizer warning threshold.

5.   JUMPERS AND USER ADJUSTMENTS

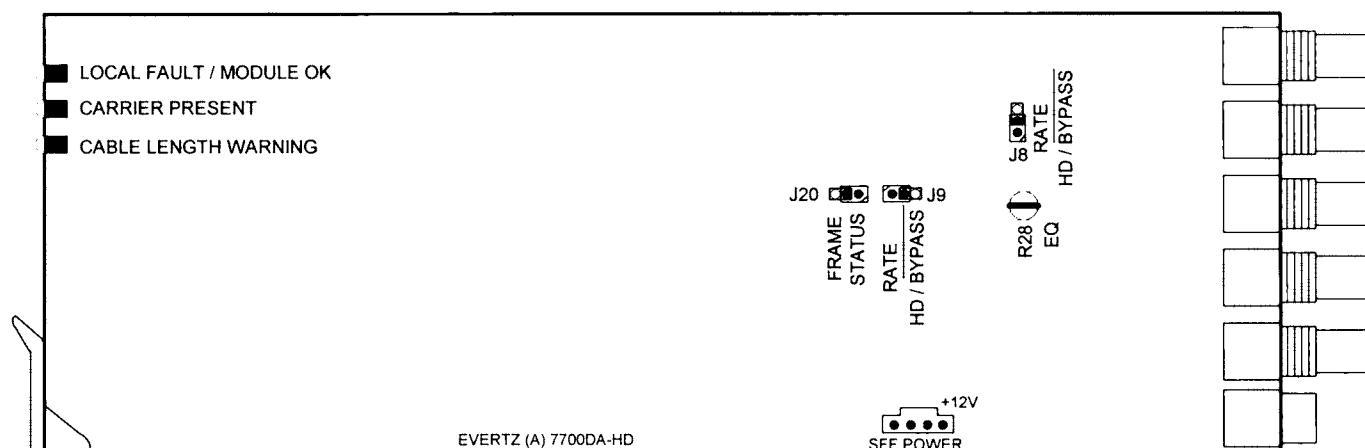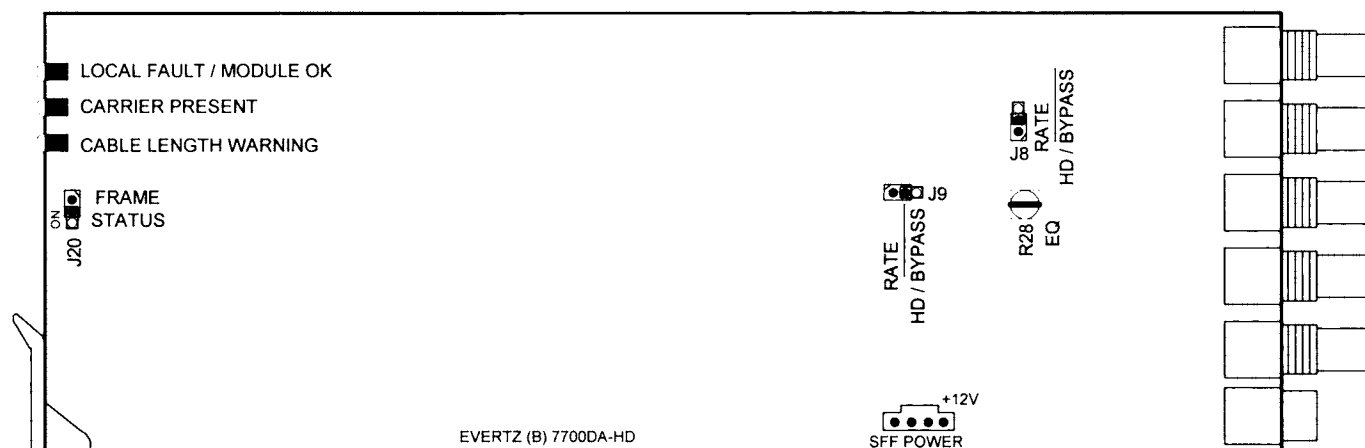**Figure 3: Jumper Locations for Rev A and Rev 1 DA Cards**

Figure 4: Jumper Locations for Rev B DA Cards
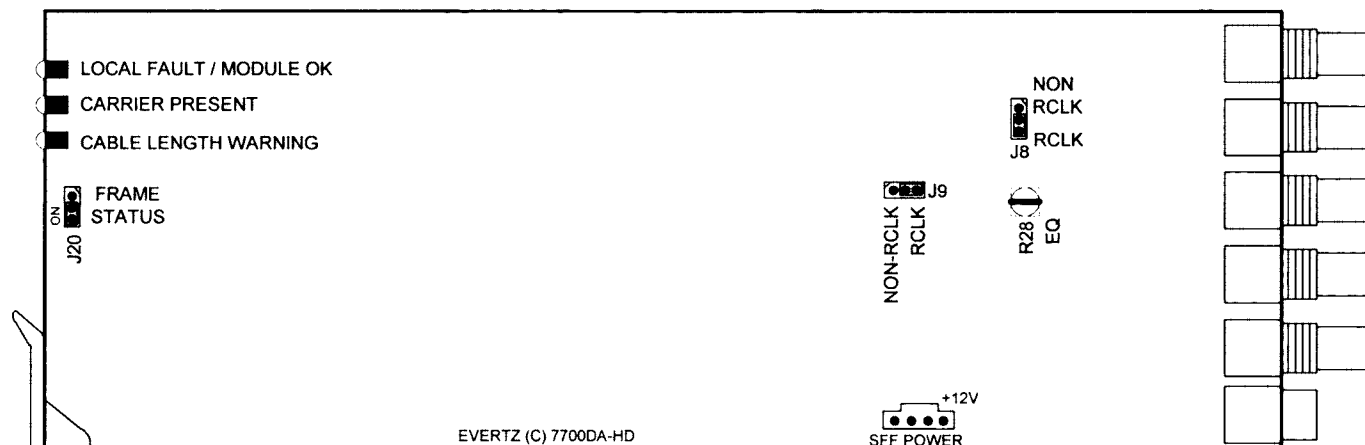
Figure 5: Jumper Locations for Rev C DA Cards

Note: On 7700DA8-HD jumpers J8 and J9 are installed on the rear of the main card

5.1.   SELECTING RECLOCK OR NON-RECLOCK MODE

There are two jumpers J8 and J9 that determine whether the module will operate as a reclocking distribution amplifier with SMPTE 292M (1.5 Gb/s) video signals or as a non-reclocking distribution amplifier with other data rates.

For the A and B revision of the board:

HD / BYPASS To select the normal reclocking mode remove both of these jumpers. For convenience you may re-install the jumper so that only one side is connected.

To select the non-reclocking mode install both of these jumpers.

For the C revision and later of the board:

RCLK/NON-RCLK   To select the normal reclocking mode put both of these jumpers in the *RCLK* position. To select the non-reclocking mode install both of these jumpers in the *NON-RCLK* position.

5.2.   SELECTING WHETHER LOCAL FAULTS WILL BE MONITORED BY THE GLOBAL FRAME STATUS

The FRAME STATUS jumper located at the front of the module determines whether local faults (as shown by the Local Fault indicator) will be connected to the 7700FR frame's global status bus.

FRAME STATUS   To monitor faults on this module with the frame status indicators (on the PS FRAME STATUS LED's and on the Frame's Fault Tally output) install this jumper in the On position. On Rev A and B boards install the jumper. (default)

When this jumper is installed in the Off position local faults on this module will not be monitored. On rev Rev A and B boards remove the jumper and re-install it so that only one side is connected.

5.3.   SETTING THE EQUALIZER WARNING THRESHOLD

The EQ trimpot R28 located near jumper J8 is used to set the threshold of the cable equalizer warning. The equalizer warning is factory set to 125 meters of Belden 1684 cable, but may be adjusted for other cable types or cable lengths. To adjust the cable equalizer warning threshold, connect a signal to the input of the DA using the required length of cable. Adjust the trimpot slowly until the Equalizer warning LED comes on. You can verify that the equalizer warning is operating correctly by removing a few meters of cable from the input. The LED should go off.

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TABLE OF CONTENTS

Figures:

Tables:

REVISION HISTORY

REVISION	DESCRIPTION	DATE
Revision 0.1	First Release Edition	January, 2004
Revision 1.2	Revised Edition	June 8, 2004
Revision 1.3	Added features & updated block diagram	October 2004

1. OVERVIEW

The 7760CCM-HD Closed Caption card is a EIA608 / EIA708 translator and extends the signal monitoring capabilities of the Evertz monitoring product line by focusing on closed captioning (EIA-608 & EIA-708) and Extended Data Service (XDS). The 7760CCM-HD has the capability to translate EIA608 captions to EIA708 Captions supporting SMPTE 333M and Grand Alliance format for RS-232 transfer. The 7760CCM-HD also converts SMPTE 334M VANC captions to SMPTE 333M or Grand Alliance Format for RS232 transfer.

The auto detect program input supports both standard definition and high definition formats. The 7760CCM-HD's EIA-608 decoder is capable of decoding VBI line 21, field 1 and 2 and displaying the information on the monitoring output. One of four caption channels (CC1-CC4) and one of four text service channels (T1-T4) can be simultaneously displayed on the monitoring output. In addition, the scrolling XDS display supports all data packets including TSID, CGMS-A, V-Chip, Station Name and Station ID. The EIA-708 decoder is capable of decoding all HD closed caption service channels and displaying the open options on the monitoring output**.

The 7760CCM-HD occupies one card slot and can be housed in either a 1RU frame which will hold up to 3 modules, a 3RU frame which will hold up to 15 modules or a standalone enclosure which will hold 1 module.

**NOTE: The built in EIA-708 caption decoder does not support the full feature-set of EIA-708 advance captions and is provided for monitoring & verifying captions only.

Figure 1: 7760CCM-HD Application Diagram

Features:

- EIA608 / EIA708 translator provides SMPTE 333M or Grand Alliance format output for RS-232 raw caption data transfer
- Supports SMPTE 333M and Grand Alliance Protocol for convenient interface to most ATSC Encoders
- Built in bypass relay on program output video path
- Auto-detect SMPTE 259M (143 to 540 Mb/s), SMPTE 292M (1.5Gb/s) signal input
- Monitoring output decodes and displays upstream EIA608 and EIA708 captions
- Decodes and displays closed captions & XDS information on field 1 and 2 for the EIA-608 standard
- Decodes and displays closed caption information for the EIA-708 standard
- Decodes XDS packets containing TSID, CGMS-A, Program ID, Time in Show, Program Name, Program Type, V-Chip rating, Program Description, Network Name, Station ID, Time of Day and Time of Zone

2. INSTALLATION

The 7760CCM-HD module comes with a companion rear plate that has 3 BNC connectors and one high-density female DB-15 and occupies one slot in the 7700FR frame. A DB-15 to DB-9 cable (WCCMTIO) is also included for port communication. For information on mounting the rear plate and inserting the module into the frame see the 7700FR chapter (Section 3).

The 7760CCM-HD card must be inserted into the slot with the correct rear panel. Some cards have physical differences and some have functional differences and the associated labels will be misleading.

2.1. VIDEO IN AND OUT

Connect a source of HD-SDI or SD-SDI video to the top BNC labeled PGM INPUT. The Input of the 7760CCM-HD will auto detect if the upstream video is SD-SDI or HD-SDI. Unprocessed, re-clocked video output is available on the PGM OUTPUT BNC. Monitoring video with text burn is available on the MON OUTPUT BNC. The output video standard of the PGM and MON output will be the same as the PGM INPUT video. If the card is not present, there will be no signal on any of the outputs. If the card is present, and the power is off, the Bypass relay will be enabled and pass the PGM INPUT to the PGM OUTPUT.

2.2. GENERAL PURPOSE INPUTS AND OUTPUTS

The GPI's are active low with internal pull up resistors (4.7k Ohms) to +5V. To make an input active, lower the signal to near ground potential (i.e. connect to shell or chassis ground). This can be done with a switch, relay, TTL drive, GPO output or other similar method. Figure 2 shows the input circuit for the General Purpose inputs.

Figure 2: GPI Input Circuitry

The GPO's are software programmable active high or low with internal pull up (18kΩ) resistors to +5V. When the output goes low it is able to sink up to 10mA. When high, the signal will go high (+5V). **Do not draw more than 100μA from the output.** Figure 3 shows the circuit for the General Purpose output.

Figure 3: GPO Output Circuitry

2.3. HDDB-15 TO DB-9 7760CCM-T COMMUNICATIONS PORT CABLE

This cable (Evertz Part #: WACCMIO-1-0-6F) is designed to connect the Evertz 7760CCM-HD products to a captioning product. The 7760CCM-HD has a HD-DB-15 "AUX I/O" connector while the user application end will be a female DB-9 configured as a RS-232 DTE without hardware flow control.

2.3.1. AUX I/O Cable End

The comm port and GPI inputs/outputs are available on the female high density DB-15 connector labeled "AUX I/O". The cable must have a male connector. Table 1 describes the pin-out of the HD-DB-15 connector.

HB DB-15	Name	Description
1	GPI4	GPI input 4
2	TxD	RS-232 Transmit Output
3	GPI3	GPI input 3
4	GPI1	GPI input 1
5	GND	Ground
6	RxD	RS-232 Receive Input
7	N/C	Not connected
8	GPI2	GPI input 2
9	GND	Ground
10	N/C	Not connected
11	N/C	Not connected
12	GND	Ground
13	GPO1	GPI Output 1
14	GPO2	GPI Output 2
15	N/C	Not connected
Shell	GND	Ground

Table 1: 7760CCM-HD AUX I/O Pin-out

The physical layout looks like this:

		6	RxD			
1	GPI4	7	N/C		11	N/C
2	TxD	8	GPI2		12	GND
3	GPI3	9	GND		13	GPO1
4	GPI1	10	N/C		14	GPO2
5	GND				15	N/C

Connect to the shell for ground.

Table 2: 7760CCM-HD AUX I/O Physical Layout

2.3.2. DB-9 Communication and GPI/O Cable End

The female DB-9 connector has RS-232 DTE connections.

Name	Description	DB-9
GPI1	N/C	1
GPI2	N/C	4
GPO1	N/C	6
GPO2	N/C	9
RxD	RS-232(from CCM-HD to equipment)	2
TxD	RS-232 (from equipment to CCM-HD)	3
RTS	RS-232 (tied to pin 8)	7
CTS	RS-232 (tied to pin 7)	8
Gnd	Ground	5, Shell

Table 3: COM and AUX I/O Pin-out

The physical layout looks like this:

1	N/C	6	N/C
2	TxD	7	RTS
3	RxD	8	CTS
4	N/C	9	N/C
5	Gnd		

The shell is also grounded.

Table 4: COM and AUX I/O Physical Layout

2.3.3. Cable Connections

Pins 7 and 8 are shorted together to simulate hardware flow control for those devices that need it. The connectors are connected as follows:

Name	Description	DB-9 Pin #	HD DB-15 Pin #
RxD	RS-232 (from CCM-HD to equipment)	2	2
TxD	RS-232 (from equipment to CCM-HD)	3	6
RTS	RS-232	7 *	NONE
CTS	RS-232	8 *	NONE
GND	Ground	5, Shell	5, Shell

Table 5: Cable Connections

3. SPECIFICATIONS

3.1. HD/SD SERIAL DIGITAL INPUT:

Standard: SMPTE 259M-C, SMPTE 292M
Connector: 1 BNC per IEC 169-8
Termination: 75 ohm
Equalization: Automatic to 100m @ 1.5Gb/s with Belden 1694
                   (or equivalent)
                   Automatic to 250m @270Mb/s with Belden 1694
                   (or equivalent)
Return Loss: >10dB up to 1.5 Gb/s

3.2. RECLOCKED OUTPUT:

Standard: Same as input
Number of Outputs: 1
Connector: BNC per IEC 169-8
Signal Level: 800mV nominal
DC Offset: 0V ±0.5V
Rise and Fall Time: 200ps nominal
Overshoot: < 10% of amplitude
Return Loss: > 10db up to 1.5 Gb/s
Wideband Jitter: < 0.2 UI

3.3. SD-SDI MONITORING OUTPUT:

Standard: SMPTE 259M-C
Reclocked Outputs: 1
Connector: BNC per IEC 169-8
Signal Level: 800mV nominal
Rise and Fall Time: 740ps nominal
Output Impedance: 75
Return Loss: >15dB up to 270Mb/s

3.4. HD-SDI MONITORING OUTPUT:

Standard: SMPTE 292M
Reclocked Outputs: 1
Connector: BNC per IEC 169-8
Signal Level: 800mV nominal
Rise and Fall Time: 200ps nominal
Overshoot: <10% of amplitude
Return Loss: >12db up to 1.5 Gb/s

3.5. GENERAL PURPOSE INTERFACE (GPI) INPUT/OUTPUT:

Number of Inputs: 4 (behavior is assigned via on screen menu items)
Number of Outputs: 2 (behavior is assigned via on screen menu items)
Type: Opto-isolated, active low with internal pull-ups to +5V
Connector: Female High Density DB-15
Signal Level: +5V nominal

3.6. SERIAL PORT:

Standard: RS-232
Connector: Female High Density DB-15
Baud Rate: 19200/38400/57600
Format: 8-bits, no parity, 1 stop bits and no flow control

3.7. ELECTRICAL:

Voltage: +12V DC
Power: 12 Watts
EMI/RFI: Complies with FCC Part 15 Class A
EU EMC Directive

3.8. PHYSICAL:

Number of Slots: 1

4.   STATUS LEDS

4.1.   7760CCM-HD MODULE STATUS LEDS

The 7707CCM-HD module has 8 LED Status indicators on the front card edge to show operational status of the card at a glance.

Three large LEDs on the front of the board indicate the general health and status of the module

LOCAL FAULT: This Red LED indicates poor module health and will be if a board power fault exists (i.e.: a blown fuse). The LOCAL FAULT indication can also be reported to the frame through the FRAME STATUS jumper.

MODULE OK: This Green LED indicates good module health. It will be On when the board power is good.

SIGNAL PRESENT: This Green LED will be on when there is a valid HD-SDI or SD-SDI video signal present at the module PGM input.

Five Small LEDs on the front of the board have not yet been assigned any functionality.

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5. ON SCREEN MENUS

5.1. NAGIVATING THE ON SCREEN MENU SYSTEM

A toggle switch and pushbutton allow card edge navigation of a set of on-screen menus used to configure the card.

To enter the on-screen menu system, press the pushbutton once. This will bring you to the main setup menu where you can use the toggle switch to move up and down the list of available sub menus. An arrow (>) moves up and down the left hand side of the menu items to indicate which item you are currently choosing. Once the arrow is on the desired item, press the pushbutton to select the next menu level.

On all menus, there are two extra selectable items: *Back* and *Exit.* Selecting *Back* will take you to the previous menu (the one that was used to get into the current menu) while *Exit* will return the display to its normal operating mode. On the main menu, BACK and EXIT will both take you to the normal operating mode.

Once in a sub menu, there may be another menu layer, or there may be a list of parameters to adjust. If there is another set of menu choices, use the toggle switch to select the desired menu item and press the pushbutton.

To adjust any parameter, use the toggle switch to move up or down to the desired parameter and press the pushbutton. The arrow will move to the right hand side of the line (<) indicating that you can now adjust the parameter. Using the toggle switch, adjust the parameter to its desired value. If the parameter is a numerical value, the number will increase if you lift the toggle switch and decrease if you push down on the toggle switch. If the parameter contains a list of choices, you can cycle through the list by pressing the toggle switch in either direction.

When you have stopped at the desired value, depress the pushbutton. This will update the parameter to the selected value and move the arrow back to the left side of the parameter list (>). Continue selecting and adjusting other parameters or use the BACK or EXIT commands.

5.2. CHANGING TEXT FIELDS

Some of the controls of the OSD menu allow you to adjust a text-based field. Editing a line of text can be a little tedious with a toggle switch and a pushbutton, but it can be done with the following procedure:

1.   Select the text to edit by pressing the pushbutton when the menu item is selected. This will take you to a screen that has the label/name of the text being edited and a white box. The white box contains the text to change and is drawn to the maximum size of the text field.
        SAMPLE TEXT
        ^

        Note the arrow (^) under the character. This indicates which character you will be changing with the toggle switch.

2.   Use the toggle switch to change the first character of the text message.

3.   Once you have selected the desired character, press the pushbutton. This will advance the arrow to the next character. Continue changing the remainder of the characters in the same way.

4.   There are two special characters to help you enter the text: a backspace character (left pointing arrow), and an end of line character (stop sign):

Left Arrow: If you have accidentally advanced to the next character and want to go back, select the left arrow with the toggle switch. When you press the pushbutton, you will go back to the previous character. This will save you from having to complete the editing and re-edit it to change the mistake.

Stop sign: If you are done changing the text, and the new text is shorter than old text, you can terminate the line with a stop sign. When you use the pushbutton after selecting the stop sign, any remaining characters in the text field will be erased and you will return to the menu structure.

You are done editing when you reach the end of the field (maximum length), or you select the stop sign and press the pushbutton.

5.3.   ON SCREEN DISPLAY – MAIN MENU

Video	Control for video processing operation
Decoder Setup	Control for decoding EIA-608, EIA-708 Captions, and the Status display
608-708 Translator	Options to map CC and text channels to EIA-708 standard.
Fault configuration	Definition of the fault conditions. Configuration of the fault message windows.
Serial Link Setup	RS232 Serial output setup
Utilities	Options for storing and recalling presets, firmware version and upgrade, and factory reset.

The OSD menu is arranged in a layered structure that groups similar configuration items together. The following section gives a brief description of the first level of menus that appear when you enter the OSD screens. Selecting one of these items will take you to the next menu level

5.4.   CONFIGURING THE VIDEO CONTROLS

The *Video* menu is used to configure parameters associated with the video input and output features.

SD Video	Selects the SD-SDI input video standard
HD Video	Selects the HD-SDI input video standard

5.4.1. Setting the SD-SDI Video Standard

Video	The SD-SDI input video standard is selected with this control.

```
| SD Video |
    | 525 |
```

5.4.2. Setting the HD-SDI Video Standard

```
| Video        |
   | HD Video  |
      | 720p/59.94  |
      | 1080i/59.94 |
```
The HD-SDI input video standard is selected with this control

5.5. CONFIGURING THE DECODER

The Decoder Setup menu allows the user to select the decoder output of the 7760CCM-HD.

Display Select	Selects the information that will be displayed On Screen
EIA-608 Decoder	Configures the EIA-608 decoder display
EIA-708 Decoder	Configures the EIA-708 decoder display
Status Disp	Displays the Status of the selected Faults

5.5.1. Setting the Decoder Display output

```
| Decoder Setup      |
   | Display Select  |
      | Off           |
      | EIA-608 Decoder |
      | EIA-708 Decoder |
      | Status Display  |
```

Select one of the four display options:
The EIA-608 Decoder is configured under the EIA-608 Decoder menu outlined under section 5.5.2
The EIA-708 Decoder is configured under the EIA-608 Decoder menu outlined under section 5.5.3
The Status Display is configured under the Status Disp menu outlined under section 5.5.10

5.5.2. Configuring the EIA-608 Decoder Closed Caption Channel

```
Decoder Setup
    EIA-608 Decoder
        CC Channel
            1 to 4
            Off
```

Selects the EIA-608 caption channel that the decoder will decode. Channels 1 through 4 can be selected or the function can be turned off.

5.5.3. Configuring the EIA-608 Decoder Text Channel

```
Decoder Setup
    EIA-608 Decoder
        Text Channel
            1 to 4
            Off
```

Selects the EIA-608 text channel that the decoder will decode. Channels 1 through 4 can be selected or the function can be turned off.

5.5.4. Configuring the EIA-608 Decoder Text window position

```
Decoder Setup
    EIA-608 Decoder
        Text Top Row
            1-15
```

This feature allows the user to anchor the position of the Text Window displayed on the OSD.

5.5.5. Configuring the EIA-608 Decoder Text window Height

```
Decoder Setup
    EIA-608 Decoder
        Text Height
            2-15
```

Allows the user to select the height of the Text Window displaying the Text Channel information on the OSD

5.5.6. Configuring the EIA-608 Decoder XDS Window Display type

```
Decoder Setup
    EIA-608 Decoder
        XDS Display
            Fixed Position
            Scrolling Display
            Off
```

The information display of the XDS window can be configured three different ways. Fixed position window is at a constant height and will display the XDS information within the selected area.
Scrolling Display will display the XDS information as it is received by the car.
Selecting Off will disable the XDS feature

5.5.7. Configuring the EIA-608 Decoder XDS Anchor point

```
Decoder Setup
    EIA-608 Decoder
        XDS Top Row
            1-15
```

This feature allows the user to anchor the position of the XDS Window displayed on the OSD.

5.5.8. Configuring the EIA-608 Decoder XDS Window height

Decoder Setup
EIA-608 Decoder
XDS Height
2-15

Allows the user to select the height of the XDS Window displaying the XDS information on the OSD

5.5.9. Configuring the EIA-708 Decoder Channel Select

Decoder Setup
EIA-708 Decoder
CC Service Channel
1 - 63

This allows the user to select the EIA-708 CC service to be decoded. Services 1 through 63 can be selected.

5.5.10. Configuring the Status Display

Decoder Setup
Status Disp
SMPTE 333M Faults

The Status Disp menu allows the user to configure the Faults that will be displayed in the Status Display Window. Currently, the 7760CCM-HD only displays SMPTE 333M faults

5.6. CONFIGURING THE 608-708 TRANSLATOR

The 608-708 Translator menu is used to configure parameters associated with the EIA-608 to EIA-708 translator.

608/708 Delay Queue
CC/Text Channel

Allows the user to add delay to the captions between the 608 to 708 translation process
Configures which EIA-608 channels to trans

5.6.1. Configuring the 608-708 delay Queue

608-708 Translator
608/708 delay queue
0 frames
1-30

Configures the number of frames of delay introduced when translating captions from EIA-608 to EIA-708

5.6.2. Defining 608 to 708 translation

608-708 Translator
CC/Text Channel
CC1
Disable
1-63

The CC/Text Channel parameter allows the user to select which EIA-708 service the EIA-608 CC or Text channels will be mapped to. Services 1 through 63 are available. For simplicity, only CC1 is shown. CC2 to CC4 and Text 1 to Text 4 are configured the same.

5.7. FAULT CONFIGURATION PARAMETERS

Fault Condition 1	Configures the parameters that will enable Fault Conditions
Fault Condition 2	Configures the parameters that will enable Fault Conditions
Fault Condition 3	Configures the parameters that will enable Fault Conditions
Fault Condition 4	Configures the parameters that will enable Fault Conditions

5.7.1. Configuring Fault Condition 1 Video Absent

```
Fault Configuration
   Fault Definition 1
      Video Absent
         Enable
         Disable
```

Enabling this parameter will trigger Fault Definition 1 when video is absent upstream to the 7760CCM-HD. Select Disable to turn this feature off. Fault Conditions two, three, and four are configured the same way as Fault Condition 1.

5.7.2. Configuring Fault Condition 1 CC Waveform Absent

```
Fault Configuration
   Fault Definition 1
      CC Waveform Absent
         Enable
         Disable
```

Enabling this parameter will trigger Fault Definition 1 when Closed Captions are not present in the upstream SD-SDI or HD-SDI video. Select Disable to turn this feature off. Fault Conditions two, three, and four are configured the same way as Fault Condition 1.

5.8. CONFIGURING THE SERIAL LINK SETUP

```
Serial Link Setup
   Off
   SMPTE 333M
   Grand Alliance
```

The Serial output of the 7760CCM-HD can be configured for either SMPTE 333M or Grand Alliance protocols. Please ensure the Serial Link setting is configured properly to communicate with your ATSC encoder. Selecting Off will disable RS232 communication.

5.9. USING THE 7760CCM-HD UTILITIES

The tools in the utilities menu allow the user gather, save, and restore information and configurations for the 7760CCM-HD card.

About...	Provides information about your 7760CCM-HD card
Store Presets 1 through 4	Stores the configurations of the 7760CCM-HD card
Recall Presets 1 through 4	Configures the parameters that will enable Fault Conditions

Upgrade	
Factory Reset	Configures the parameters that will enable Fault Conditions

5.9.1. Using the About Parameter

Utilities
About...

The About prameter provides information about the card regarding Software version, Hardware version, and Serial Number.

5.9.2. Storing Presets

Utilities
Store Preset 1
Store
Cancel

This feature allows the user to store the current settings of the 7760CCM-HD card. These presets can be recalled at any time using the Recall Preset function.
Presets 2 through 4 are stored the same way as Preset 1

5.9.3. Recalling Presets

Utilities
Recall Preset 1
Recall
Cancel

This feature allows the user to recall the stored settings of the 7760CCM-HD card. These presets are stored using the Store preset function.
Presets 2 through 4 are recalled the same way as Preset 1

5.9.4. Card edge Upgrade

Utilities
Upgrade
Yes
Cancel

This feature allows the user to upgrade the firmware of the unit without removing it from the frame. Select Yes to begin the upgrade procedure. Please see section 8.1.2 for detailed upgrade instructions.

5.9.5. Card edge Upgrade

Utilities
Factory Reset
Yes
Cancel

This feature re-configures all parameters to default factory settings. Please note all card configuration will be lost

6. DIP SWITCH CONTROL

6.1. DIP SWITCH SETTINGS

The 7760CCM-HD has dip switches located near the card edge. Dip switch 1 is used to control the OSD (on screen display) of the monitoring output. Assure this DIP switch is set to the closed (down) position to enable the OSD. DIP switches 5,6,7, and 8 are used when setting changes are made via the card edge RS232 communication port. This is not required as the monitoring OSD allows the user to change all the configuration settings.

DIP SWITCH				Function	Options	
1	**2**	**3**	**4**			
up	up	up	up	none	none	
down	up	up	up	Enables On Screen Display		
5	**6**	**7**	**8**			
up	up	up	up	none	none	
up	up	up	down	HD Video Standard	1080i/60 **1080i/59.94** 1080i/50 1080p/30 1080p/29.97 1080p/25	1080p/24 1080p/23.98 720p/60 720p/59.94 1035i/60 1035i/59.94
up	up	down	up	CC1 to EIA-708 Service Number	off, **1..63**	
up	up	down	down	CC2 to EIA-708 Service Number	**off**, 1..63	
up	down	up	up	CC3 to EIA-708 Service Number	**off**, 1..63	
up	down	up	down	CC4 to EIA-708 Service Number	**off**, 1..63	
up	down	down	up	T1 to EIA-708 Service Number	**off**, 1..63	
up	down	down	down	T2 to EIA-708 Service Number	**off**, 1..63	
down	up	up	up	T3 to EIA-708 Service Number	**off**, 1..63	
down	up	up	down	T4 to EIA-708 Service Number	**off**, 1..63	
down	up	down	up	608-to-708 delay	**0**..31 frames	
down	up	down	down	RS-232 Serial Link Setup	off **SMPTE-333M** Grand Alliance	
down	down	up	up	none	none	
down	down	up	down	none	none	
down	down	down	up	none	none	
down	down	down	down	none	none	

PLEASE ENSURE DIP SWITCH 1 IS IN THE DOWN (CLOSE) POSITION IN ORDER TO ENABLE THE ON SCREEN DISPLAY

6.2. CHANGING PARAMETERS USING THE DIP SWITCHES

1. Set DIP switch 1 to the open position.

2. Using the WPCCMTIO cable, connect DB15 on rear panel of 7760CCM-HD to the SMPTE-333M caption ingest port on the ATSC encoder. The pin-out of the DB9M is DTE. The null-modem cable is also required for some ATSC encoders, to convert the pin-out to DCE.

3. Connect HD-SDI video to the SDI INPUT BNC connector on the rear panel of 7760CCM-HD. Note that the video outputs of 7760CCM-HD are not yet functional.

4. Connect the 6-way ribbon cable from J24 (debug serial port) on the 7760CCM-HD card to an available RS-232 serial COM port on the PC.

5. On the PC, run a serial terminal program such as HyperTerminal to communicate with the 7760CCM-HD. COM setup is: 57,600 baud, 8 data bits, NO parity bits, 1 stop bit, NO flow control.

6. Apply +12V power to the 7760CCM-HD. You will see text appear in the terminal window similar to:

```
EVERTZ MCF5407 MONITOR 2.5 BUILD 9
COPYRIGHT 1997, 1998, 1999, 2000, 2001, 2002 EVERTZ MICROSYSTEMS LTD.
28F160C3B FLASH DETECTED
MCF5407 COLD BOOT> BOOTING...
(A)7700PH3 7760CCM-HD hardware build 1, S/N 0000000000.
7760CCM-HD software v1.00 build 1
Load virtex
Reset virtex
Init virtex
Init presets
Preset version is 0
Enable interrupts
Initialize UI
```

Use DIP5 to DIP8 to select the desired parameter. Use the DIP switch table on the previous table to select the parameters that need to be changed.
Use toggle switch to select desired option. The parameter will appear on the terminal program.
Use pushbutton to remind you what the parameter is set to.

7. JUMPERS

7.1. SELECTING WHETHER LOCAL FAULTS WILL BE MONITORED BY THE GLOBAL FRAME STATUS

The FRAME STATUS jumper J22 determines whether local faults (as shown by the Local Fault indicator) will be connected to the 7700FR frame's global status bus.

FRAME STATUS To monitor faults on this module with the frame status indicators (on the Power Supply FRAME STATUS LED's and on the Frame's Fault Tally output) install this jumper in the On position. (Default)

When this jumper is installed in the Off position local faults on this module will not be monitored.

7.2. SETTING THE 7760CCM-HD INTO RUN AND UPGRADE MODE

RUN/UPGRADE The Run/Upgrade jumper is set to Run during normal operation of the card. When the firmware needs to be upgraded, the jumper is set to the upgrade mode. Please see section 8 for instructions on how to upgrade firmware.

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8. FIRMWARE UPGRADE

8.1. FIRMWARE UPGRADE

1. Connect the 6-way ribbon cable from J24 (debug serial port) on the 7760CCM-HD card to an available RS-232 serial COM port on the PC.

2. On the PC, run a serial terminal program such as HyperTerminal to communicate with the 7760CCM-HD. COM setup is: 57,600 baud, 8 data bits, NO parity bits, 1 stop bit, NO flow control.

8.1.1. Upgrading using the Run/Upgrade Jumper

3. Set the Upgrade/Run Jumper to Upgrade. Power the unit.

4. You will see this prompt appear on the terminal program:

```
EVERTZ MCF5407 MONITOR 2.5 BUILD 9
COPYRIGHT 1997, 1998, 1999, 2000, 2001, 2002 EVERTZ MICROSYSTEMS LTD.
28F160C3B FLASH DETECTED
BRD=7700PH3
MODEL=BA7700PH3-CCMHD
PROD=7760CCM-HD
FRAME=7700FR
UPGRADE JUMPER INSTALLED

UPLOAD FILE NOW, CONTROL-X TO CANCEL
```

5. Send the .bin file to the 7760CCM-HD using the **Xmodem** protocol.

6. After the file is uploaded into the 7760CCM-HD, set the Upgrade/Run jumper back to the Run position and power cycle the unit.

8.1.2. Upgrading using the OSD Menu

The unit does not need to be powered down for this method of upgrade

Select the Upgrade sub-menu under the Utilities menu and select YES to begin upgrade. See section 5.9.4.

You will see this prompt appear on the terminal program:
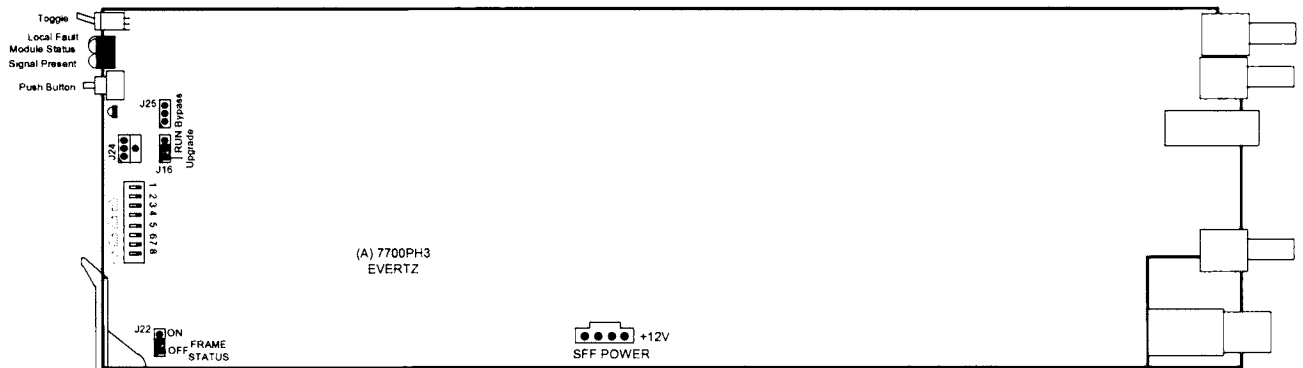
```
EVERTZ MCF5407 MONITOR 2.5 BUILD 9
COPYRIGHT 1997, 1998, 1999, 2000, 2001, 2002 EVERTZ MICROSYSTEMS LTD.
28F160C3B FLASH DETECTED
BRD=7700PH3
MODEL=BA7700PH3-CCMHD
PROD=7760CCM-HD
```

FRAME=7700FR
UPGRADE JUMPER INSTALLED

UPLOAD FILE NOW, CONTROL-X TO CANCEL

Send the .bin file to the 7760CCM-HD using the **Xmodem** protocol.

After the file is uploaded, the upgrade is complete.

9. MENU QUICK REFERENCE

VIDEO
  SD Video
    525
  HD Video
    720p/59.94
    1080i/59.94

DECODER SETUP
  Display Select
    Off
    EIA-608 Decoder
    EIA-708 Decoder
    Status Display
  EIA-608 Decoder
    CC channel
      1 to 4
      Off
    Text Channel
      1 to 4
      Off
    Text Top Row
      1 – 15
      6
    Text Height
      2 – 15
      5
    XDS Display
      Fixed Position
      Scrolling Display
      Off
    XDS Top row
      1 – 15 **(1)**
    XDS Height
      2 – 15 **(5)**
  EIA-708 Decoder
    CC service Channel
      1 – 63
  Status Disp
    SMPTE 333M Faults

608-708 TRANSLATOR
  608/708 delay queue
    0 Frames
    1 - 30
  CC/TEXT Channel
    CC1
      Disable
      1 - 63
    CC2
      Disable
      1 - 63
    CC3
      Disable
      1 - 63
    CC4
      Disable
      1 - 63
    T1
      Disable
      1 - 63

    T2
      Disable
      1 - 63
    T2
      Disable
      1 - 63
    T3
      Disable
      1 - 63
    T4
      Disable
      1 – 63

FAULT CONFIGURATION
  Fault condition 1
    Fault definition 1
      Video absent
        Enable
        Disable
      CC waveform absent
        Enable
        Disable

    Fault Condition 2 (*same as Fault Condition 1*)
    Fault Condition 3 (*same as Fault Condition 1*)
    Fault Condition 4 (*same as Fault Condition 1*)

SERIAL LINK SETUP
  Off
  SMPTE 333M
  Grand Alliance

UTILITIES
  About…
  Store preset 1
    Store
    Cancel
  Store preset 2
    Store
    Cancel
  Store preset 3
    Store
    Cancel
  Recall preset 1
    Load
    Cancel
  Recall preset 2
    Load
    Cancel
  Recall preset 3
    Load
    Cancel
  Upgrade
    Yes
    Cancel
  Factory reset
    Yes
    Cancel

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10. *VISTA*LINK™ REMOTE MONITORING/CONTROL

10.1. WHAT IS *VISTA*LINK™?

*Vista*LINK™ is Evertz's remote monitoring and control capability over an Ethernet network using Simple Network Management Protocol (SNMP). SNMP is a standard computer network protocol that enables different devices sharing the same network to communicate with each other. For monitoring, there needs to be a detecting device that automatically reports all errors to a central alarm and error logging station. We also need to be able to interrogate individual detector devices from the central station to determine the status of individual channels. Finally, we need to be able to configure devices in the network from the central station and receive feedback that the configuration has been carried out.

There are 3 components of SNMP:

1. An SNMP manager also known as a Network Management System (NMS) is a computer running special software that communicates with the devices in the network. Evertz VL-Fiber demo Manager graphical user interface (GUI), third party or custom manager software may be used to monitor and control Evertz *Vista*LINK™ enabled fiber optic products.

2. Managed devices (such as 7707IT cards), each with a unique address (OID), communicate with the NMS through an SNMP Agent. Evertz *Vista*LINK™ enabled 7700 series modules reside in the 3RU 7700FR-C MultiFrame and communicate with the manager via the 7700FC *Vista*LINK™ frame controller module, which serves as the Agent.

3. A virtual database known as the Management information Base (MIB) lists all the variables being monitored and which both the Manager and Agent understand. Please contact Evertz for further information about obtaining a copy of the MIB for interfacing to a third party Manager/NMS.

For more information on connecting and configuring the *Vista*LINK™ network, see the 7700FC Frame Controller chapter.

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11. GLOSSARY

11.1. GLOSSARY OF STANDARDS

EIA (Electronic Industries Alliance): An association of trade associations representing various facets of the electronics industry. Each of these EIA Sector Associations manages its own standards-setting programs under EIA, the umbrella organization.

EIA-608-B: This EIA standard serves as a technical guide for those providing encoding equipment and/or decoding equipment to produce material with encoded data embedded in Line 21 of the vertical blanking interval of the NTSC video signal. It is also a usage guide for those who will produce material using such equipment

EIA-708-B defines the coding of DTV closed captions (DTVCC) as they are delivered in an ATSC signal, and also defines the Caption Distribution Packet (CDP). This structure contains fields that can hold: EIA-608-B data for use if the video is converted to standard definition analog; DTV captions for use in an ATSC program; Caption Descriptors; and Time Code. The CDP is the basic unit of data that is transported through the professional portion of a DTV plant. As such, it is central to the methods discussed in this document.

EIA-744-A: The EIA standard that defines the formatting of content advisory information accommodating either U.S. or Canadian systems, as well as the movie industry's MPAA rating system using the vertical blanking interval. EIA 744-A redefines the XDS Program Rating (content advisory) packet, 05h, currently contained in **EIA-608-B**, section 6.5.1, Current Class.

EIA-746-A: This document is a proposed amendment to EIA-608-A to insert Internet Uniform Resource. Locators (URLs) within the line-21 data system using the Text-2 (T-2) service. These URLs may be used by receiving devices in a variety of ways to associate Internet content with related television broadcast content

SMPTE (Society of Motion Picture and Television Engineers): A professional organization that recommends standards for the film and television industries.

SMPTE 12M: The SMPTE standard for linear time code.

SMPTE 125M: The SMPTE standard for bit parallel digital interface for component video signals. .SMPTE 125M defines the parameters required to generate and distribute component video signals on a parallel interface.

SMPTE 244M: The SMPTE standard for bit parallel digital interface for composite video signals. SMPTE 244M defines the parameters required to generate and distribute composite video signals on a parallel interface.

SMPTE 259M: The SMPTE standard for 525 line serial digital component and composite interfaces.

SMPTE 269M: This SMPTE standard defines an opto-isolated fault tally output signal for connecting to.user-defined equipment such as warning indicators.

SMPTE 291M: defines the method of multiplexing ancillary data such as audio and captions to 292M and 259M signals.

SMPTE 292M: defines the serial interface that is used for carriage of HDTV video signals. It and its standard definition equivalent 259M provide a standard transport mechanism, not only for the video signal, but also for digitized audio and data such as captions.

SMPTE 309M: The SMPTE standard for encoding date information into the user bits of linear time code.

SMPTE 333M: The SMPTE standard for serially interfacing captioning equipment with ATSC caption encoders

SMPTE 334M: assigns addresses to be used to multiplex specific data services such as captioning into the vertical ancillary (VANC) space defined by 291M. It also specifies that the payload of a VANC packet used for captioning is CDP.

11.2. GLOSSARY OF TERMS

AES: (Audio Engineering Society): A professional organization that recommends standards for the audio industries.

AES/EBU: Informal name for a digital audio standard established jointly by the Audio Engineering Society and the European Broadcasting Union organizations.

ANALOG: An adjective describing any signal that varies continuously as opposed to a digital signal that contains discrete levels representing digits 0 and 1.

A-TO D CONVERTER (ANALOG-TO-DIGITAL): A circuit that uses digital sampling to convert an analog signal into a digital representation of that signal.

ATSC A/65: defines information that describes the contents of an ATSC broadcast. Some of this information may pertain to the closed captioning.

BIT: A binary representation of 0 or 1. One of the quantized levels of a pixel.

BIT PARALLEL: Byte-wise transmission of digital video down a multi-conductor cable where each pair of wires carries a single bit. This standard is covered under SMPTE 125M, EBU 3267-E and CCIR 656.

BIT SERIAL: Bit-wise transmission of digital video down a single conductor such as coaxial cable. May also be sent through fiber optics. This standard is covered under SMPTE 259M and CCIR 656.

BIT STREAM: A continuous series of bits transmitted on a line.

BNC: Abbreviation of "baby N connector". A cable connector used extensively in television systems.

BYTE: A complete set of quantized levels containing all the bits. Bytes consisting of 8 to 10 bits per sample are typical in digital video systems.

CABLE EQUALIZATION: The process of altering the frequency response of a video amplifier to compensate for high frequency losses in coaxial cable.

CDP: caption distribution Packet, defined in EIA-708.

CCIR (International Radio Consultative Committee): An international standards committee. (This organization is now known as ITU.)

CCIR-601: See ITU-R601

CCIR-656: See ITU-R656

CLIFF EFFECT: (also referred to as the 'digital cliff') This is a phenomenon found in digital video systems that describes the sudden deterioration of picture quality when doe to excessive bit errors, often caused by excessive cable lengths. The digital signal will be perfect even though one of its signal parameters is approaching or passing the specified limits. At a given moment however, the parameter

will reach a point where the data can no longer be interpreted correctly, and the picture will be totally unrecognizable.

COMPONENT ANALOG: The non-encoded output of a camera, video tape recorder, etc., consisting of the three primary colour signals: red, green, and blue (RGB) that together convey all necessary picture information. In some component video formats these three components have been translated into a luminance signal and two colour difference signals, for example Y, B-Y, R-Y.

COMPONENT DIGITAL: A digital representation of a component analog signal set, most often Y, B-Y, R-Y. The encoding parameters are specified by ITU-R601. ITU-R656 and SMPTE 125M specify the parallel interface.

COMPOSITE ANALOG: An encoded video signal such as NTSC or PAL video, that includes horizontal and vertical synchronizing information.

COMPOSITE DIGITAL: A digitally encoded video signal, such as NTSC or PAL video that includes horizontal and vertical synchronizing information.

D1: A component digital video recording format that uses data conforming to the ITU-R601 standard. Records on 19 mm magnetic tape. (Often used incorrectly to refer to component digital video.)

D2: A composite digital video recording format that uses data conforming to SMPTE 244M. Records on 19 mm magnetic tape. (Often used incorrectly to refer to composite digital video.)

D3: A composite digital video recording format that uses data conforming to SMPTE 244M. Records on 1/2" magnetic tape.

DSO:(Daylight Saving time Observed)

DST (DAYLIGHT SAVING TIME): The civil time observed when daylight saving time is adopted in a country or region. It is usually standard time + 1 hour. (see also *Standard Time*)

DTVCC: Digital Television Closed Captioning, defined in EIA-708.

EBU (European Broadcasting Union): An organization of European broadcasters that among other activities provides technical recommendations for the 625/50 line television systems.

EBU TECH 3267-E: The EBU recommendation for the parallel interface of 625 line digital video signal. This is a revision of the earlier EBU Tech 3246-E standard that was in turn derived from ITU-R601.

EDH: Error Detection and Handling (EDH) is defined in SMPTE RP-165 as a method of determining when bit errors have occurred along the digital video path. Check words and flags are combined into a special error detection data packet that is included as ancillary data in the serial digital signal.

EMBEDDED AUDIO: Digital audio is multiplexed onto a serial digital video data stream.

EXTENDED DATA SERVICES (XDS): XDS is a third data service in field 2 that is intended to supply program related and other information to the viewer. This information may include such items

as program title, length of show, type of show and program content codes such as V-Chip program ratings.

ITU: The United Nations regulatory body governing all forms of communications. ITU-R (previously CCIR) regulates the radio frequency spectrum, while ITU-T (previously CCITT) deals with the telecommunications standards.

ITU-R601: (This document previously known as CCIR-601). An international standard for component digital television from which was derived SMPTE 125M and EBU 3246-E standards. ITU-R601 defines the sampling systems, matrix values and filter characteristics for both Y, B-Y, R-Y and RGB component digital television signals.

ITU-R656 (This document previously known as CCIR-656). The physical parallel and serial interconnect scheme for ITU-R601. ITU-R656 defines the parallel connector pinouts as well as the blanking, sync and multiplexing schemes used in both parallel and serial interfaces. It reflects definitions found in EBU Tech 3267 (for 625 line systems) and SMPTE 125M (parallel 525 line systems) and SMPTE 259M (serial 525 line systems).

JULIAN DATE: The Julian day number is a count of days elapsed since Greenwich mean noon on January 1, 4713B.C. January 1st, 1993 was JD 2448989; January 1st, 2000 was JD 2451545.

MODIFIED JULIAN DATE (MJD): The Modified Julian Date is a continuous count of the number of days elapsed since 17 November 1858. It is often more useful than conventional calendar dates for record keeping over long periods of time, since the MJD's of two events can easily be subtracted to determine the time difference in days. Usually, the MJD is specified as a number with 5 significant digits. As an example, the MJD for 1 January 1995 is 49718, meaning that this many days have elapsed between 17 November 1858 and 1 January 1995. The Modified Julian date is calculated by subtracting 2400000.5 days from the Julian Date. Thus the Modified Julian Day 1 begins at Greenwich midnight.

LED: Light Emitting Diode.

LINEAR TIME CODE (LTC): A digital code used for timing and control purposes on videotape and associated audiotape machines. It is recorded on a longitudinal track with audio characteristics and is referred to as LTC (Sometimes this code is also referred to as longitudinal code or SMPTE). Each 80 bit code word is associated with one television frame, and consists of 26 time bits, 6 flag bits, 32 user bits and 16 sync bits. Date information may optionally encoded into the user bits. This code is often used for distribution time of day information to station clock displays and automation systems. The SMPTE 12M standard defines LTC.

PAC: stands for Preamble Address Code. These codes are embedded into the line 21 caption data. They define the caption text position on the screen, and set special features such as colour, italics and underline.

PIXEL: The smallest distinguishable and resolvable area in a video image. A single point on the screen. In digital video, a single sample of the picture. Derived from the words *picture element*.

PSIP: Program and System Information Protocol, defined in ATSC A/65.

RESOLUTION: The number of bits (eight, ten, etc.) determines the resolution of the signal. Eight bits is the minimum resolution for broadcast television signals.

SERIAL DIGITAL (SDI):   Digital information that is transmitted in serial form. Often used informally to refer to serial digital television signals.

STANDARD TIME: The civil time adopted for a country or region. (See also *Daylight Saving Time*)

TIME ZONE OFFSET: The difference in time between the local time and UTC

TRS: Timing reference signals used in composite digital systems.
(It is four words long).

TRS-ID: Abbreviation for "Timing Reference Signal Identification". A reference signal used to maintain timing in composite digital systems. (It is four words long.)

UNIVERSAL COORDINATED TIME
UNIVERSAL TIME, COORDINATED (UTC): Universal Coordinated Time (UTC) is an international time standard that defines a time that doesn't depend on where we are on Earth. Universal Time (UTC), Greenwich Mean Time (GMT), and Zulu Time (Z), are based at the prime meridian (0° longitude) of Earth and are used to avoid confusion of time zones.

VANC: Vertical Ancillary data. Data carried in serial digital video signal (SMPTE 259M or 292M), in accordance with SMPTE 291M, in the active portion of scan lines that are outside the active picture area.

VBI: Vertical Blanking Interval. The scan lines that are outside the active picture area of a standard definition video signal (analog or serial digital). These can be used for carriage of data, including closed captioning, in analog video broadcasting.

V-Chip: Abbreviation for "Viewer Chip" (commonly misread as "Violence Chip"). V-Chip-enabled television sets extract Program Rating packets from the XDS data stream in Field 2 captions to determine the rating of a show. Also see Extended Data Services.

WebTV: The encoding of URL (Uniform Resource Locators) normally used on the Internet, into line 21 caption style data. This URL string is made up with the familiar http:// followed by a target location on the Internet. The URL must be formatted to match the Electronic Industries Association specification EIA-746-A.

XDS: See Extended Data Services.

4:2:2   A commonly used term for a component digital video format. The details of the format are specified in the ITU-R601 standard. The numerals 4:2:2 denote the ratio of the sampling frequencies of the luminance channel to the two colour difference channels. For every four luminance samples, there are two samples of each colour difference channel.

4Fsc   Four times subcarrier sampling rate used in composite digital systems. In NTSC this is 14.3 MHz. In PAL this is 17.7 MHz

evertz

TABLE OF CONTENTS

REVISION HISTORY

REVISION	DESCRIPTION	DATE
Revision 0.1	First Release Edition	January, 2004
Revision 1.2	Revised Edition	June 8, 2004
Revision 1.3	Added features & updated block diagram	October 2004

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Although every attempt has been made to accurately describe the features, installation and operation of this product in this manual, no warranty is granted nor liability assumed in relation to any errors or omissions unless specifically undertaken in the Evertz sales contract or order confirmation. Information contained in this manual is periodically updated and changes will be incorporated into subsequent editions. If you encounter an error, please notify Evertz Customer Service department. Evertz reserves the right, without notice or liability, to make changes in equipment design or specifications.

1. OVERVIEW

The 7760CCM-HD Closed Caption card is a EIA608 / EIA708 translator and extends the signal monitoring capabilities of the Evertz monitoring product line by focusing on closed captioning (EIA-608 & EIA-708) and Extended Data Service (XDS). The 7760CCM-HD has the capability to translate EIA608 captions to EIA708 Captions supporting SMPTE 333M and Grand Alliance format for RS-232 transfer. The 7760CCM-HD also converts SMPTE 334M VANC captions to SMPTE 333M or Grand Alliance Format for RS232 transfer.

The auto detect program input supports both standard definition and high definition formats. The 7760CCM-HD's EIA-608 decoder is capable of decoding VBI line 21, field 1 and 2 and displaying the information on the monitoring output. One of four caption channels (CC1-CC4) and one of four text service channels (T1-T4) can be simultaneously displayed on the monitoring output. In addition, the scrolling XDS display supports all data packets including TSID, CGMS-A, V-Chip, Station Name and Station ID. The EIA-708 decoder is capable of decoding all HD closed caption service channels and displaying the open options on the monitoring output**.

The 7760CCM-HD occupies one card slot and can be housed in either a 1RU frame which will hold up to 3 modules, a 3RU frame which will hold up to 15 modules or a standalone enclosure which will hold 1 module.

**NOTE: The built in EIA-708 caption decoder does not support the full feature-set of EIA-708 advance captions and is provided for monitoring & verifying captions only.

Figure 1: 7760CCM-HD Application Diagram

Features:

- EIA608 / EIA708 translator provides SMPTE 333M or Grand Alliance
  format output for RS-232 raw caption data transfer
- Supports SMPTE 333M and Grand Alliance Protocol for convenient interface to most ATSC
  Encoders
- Built in bypass relay on program output video path
- Auto-detect SMPTE 259M (143 to 540 Mb/s), SMPTE 292M (1.5Gb/s) signal input
- Monitoring output decodes and displays upstream EIA608 and EIA708 captions
- Decodes and displays closed captions & XDS information on field 1 and 2 for the EIA-608
  standard
- Decodes and displays closed caption information for the EIA-708 standard
- Decodes XDS packets containing TSID, CGMS-A, Program ID, Time in Show, Program Name,
  Program Type, V-Chip rating, Program Description, Network Name, Station ID, Time of Day and
  Time of Zone

2. INSTALLATION

The 7760CCM-HD module comes with a companion rear plate that has 3 BNC connectors and one high-density female DB-15 and occupies one slot in the 7700FR frame. A DB-15 to DB-9 cable (WCCMTIO) is also included for port communication. For information on mounting the rear plate and inserting the module into the frame see the 7700FR chapter (Section 3).

The 7760CCM-HD card must be inserted into the slot with the correct rear panel. Some cards have physical differences and some have functional differences and the associated labels will be misleading.

2.1. VIDEO IN AND OUT

Connect a source of HD-SDI or SD-SDI video to the top BNC labeled PGM INPUT. The Input of the 7760CCM-HD will auto detect if the upstream video is SD-SDI or HD-SDI. Unprocessed, re-clocked video output is available on the PGM OUTPUT BNC. Monitoring video with text burn is available on the MON OUTPUT BNC. The output video standard of the PGM and MON output will be the same as the PGM INPUT video. If the card is not present, there will be no signal on any of the outputs. If the card is present, and the power is off, the Bypass relay will be enabled and pass the PGM INPUT to the PGM OUTPUT.

2.2. GENERAL PURPOSE INPUTS AND OUTPUTS

The GPI's are active low with internal pull up resistors (4.7k Ohms) to +5V. To make an input active, lower the signal to near ground potential (i.e. connect to shell or chassis ground). This can be done with a switch, relay, TTL drive, GPO output or other similar method. Figure 2 shows the input circuit for the General Purpose inputs.

Figure 2: GPI Input Circuitry

The GPO's are software programmable active high or low with internal pull up (18kΩ) resistors to +5V. When the output goes low it is able to sink up to 10mA. When high, the signal will go high (+5V). **Do not draw more than 100μA from the output.** Figure 3 shows the circuit for the General Purpose output.

Figure 3: GPO Output Circuitry

2.3. HDDB-15 TO DB-9 7760CCM-T COMMUNICATIONS PORT CABLE

This cable (Evertz Part #: WACCMIO-1-0-6F) is designed to connect the Evertz 7760CCM-HD products to a captioning product. The 7760CCM-HD has a HD-DB-15 "AUX I/O" connector while the user application end will be a female DB-9 configured as a RS-232 DTE without hardware flow control.

2.3.1. AUX I/O Cable End

The comm port and GPI inputs/outputs are available on the female high density DB-15 connector labeled "AUX I/O". The cable must have a male connector. Table 1 describes the pin-out of the HD-DB-15 connector.

HB DB-15	Name	Description
1	GPI4	GPI input 4
2	TxD	RS-232 Transmit Output
3	GPI3	GPI input 3
4	GPI1	GPI input 1
5	GND	Ground
6	RxD	RS-232 Receive Input
7	N/C	Not connected
8	GPI2	GPI input 2
9	GND	Ground
10	N/C	Not connected
11	N/C	Not connected
12	GND	Ground
13	GPO1	GPI Output 1
14	GPO2	GPI Output 2
15	N/C	Not connected
Shell	GND	Ground

Table 1: 7760CCM-HD AUX I/O Pin-out

The physical layout looks like this:

			6	RxD			
1	GPI4		7	N/C		11	N/C
2	TxD		8	GPI2		12	GND
3	GPI3		9	GND		13	GPO1
4	GPI1		10	N/C		14	GPO2
5	GND					15	N/C

Connect to the shell for ground.

Table 2: 7760CCM-HD AUX I/O Physical Layout

2.3.2. DB-9 Communication and GPI/O Cable End

The female DB-9 connector has RS-232 DTE connections.

Name	Description	DB-9
GPI1	N/C	1
GPI2	N/C	4
GPO1	N/C	6
GPO2	N/C	9
RxD	RS-232(from CCM-HD to equipment)	2
TxD	RS-232 (from equipment to CCM-HD)	3
RTS	RS-232 (tied to pin 8)	7
CTS	RS-232 (tied to pin 7)	8
Gnd	Ground	5, Shell

Table 3: COM and AUX I/O Pin-out

The physical layout looks like this:

1	N/C		6	N/C
2	TxD		7	RTS
3	RxD		8	CTS
4	N/C		9	N/C
5	Gnd			

The shell is also grounded.

Table 4: COM and AUX I/O Physical Layout

2.3.3. Cable Connections

Pins 7 and 8 are shorted together to simulate hardware flow control for those devices that need it. The connectors are connected as follows:

Name	Description	DB-9 Pin #	HD DB-15 Pin #
RxD	RS-232 (from CCM-HD to equipment)	2	2
TxD	RS-232 (from equipment to CCM-HD)	3	6
RTS	RS-232	7 *	NONE
CTS	RS-232	8 *	NONE
GND	Ground	5, Shell	5, Shell

Table 5: Cable Connections

3.   SPECIFICATIONS

3.1.   HD/SD SERIAL DIGITAL INPUT:

Standard: SMPTE 259M-C, SMPTE 292M
Connector: 1 BNC per IEC 169-8
Termination: 75 ohm
Equalization: Automatic to 100m @ 1.5Gb/s with Belden 1694
                       (or equivalent)
                       Automatic to 250m @270Mb/s with Belden 1694
                       (or equivalent)
Return Loss: >10dB up to 1.5 Gb/s

3.2.   RECLOCKED OUTPUT:

Standard: Same as input
Number of Outputs: 1
Connector: BNC per IEC 169-8
Signal Level: 800mV nominal
DC Offset: 0V ±0.5V
Rise and Fall Time: 200ps nominal
Overshoot: < 10% of amplitude
Return Loss: > 10db up to 1.5 Gb/s
Wideband Jitter: < 0.2 UI

3.3.   SD-SDI MONITORING OUTPUT:

Standard: SMPTE 259M-C
Reclocked Outputs: 1
Connector: BNC per IEC 169-8
Signal Level: 800mV nominal
Rise and Fall Time: 740ps nominal
Output Impedance: 75
Return Loss: >15dB up to 270Mb/s

3.4.   HD-SDI MONITORING OUTPUT:

Standard: SMPTE 292M
Reclocked Outputs: 1
Connector: BNC per IEC 169-8
Signal Level: 800mV nominal
Rise and Fall Time: 200ps nominal
Overshoot: <10% of amplitude
Return Loss: >12db up to 1.5 Gb/s

3.5. GENERAL PURPOSE INTERFACE (GPI) INPUT/OUTPUT:

Number of Inputs: 4 (behavior is assigned via on screen menu items)
Number of Outputs: 2 (behavior is assigned via on screen menu items)
Type: Opto-isolated, active low with internal pull-ups to +5V
Connector: Female High Density DB-15
Signal Level: +5V nominal

3.6. SERIAL PORT:

Standard: RS-232
Connector: Female High Density DB-15
Baud Rate: 19200/38400/57600
Format: 8-bits, no parity, 1 stop bits and no flow control

3.7. ELECTRICAL:

Voltage: +12V DC
Power: 12 Watts
EMI/RFI: Complies with FCC Part 15 Class A
EU EMC Directive

3.8. PHYSICAL:

Number of Slots: 1

4. STATUS LEDS

4.1. 7760CCM-HD MODULE STATUS LEDS

The 7707CCM-HD module has 8 LED Status indicators on the front card edge to show operational status of the card at a glance.

Three large LEDs on the front of the board indicate the general health and status of the module

LOCAL FAULT: This Red LED indicates poor module health and will be if a board power fault exists (i.e.: a blown fuse). The LOCAL FAULT indication can also be reported to the frame through the FRAME STATUS jumper.

MODULE OK: This Green LED indicates good module health. It will be On when the board power is good.

SIGNAL PRESENT: This Green LED will be on when there is a valid HD-SDI or SD-SDI video signal present at the module PGM input.

Five Small LEDs on the front of the board have not yet been assigned any functionality.

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5.   ON SCREEN MENUS

5.1.   NAGIVATING THE ON SCREEN MENU SYSTEM

A toggle switch and pushbutton allow card edge navigation of a set of on-screen menus used to configure the card.

To enter the on-screen menu system, press the pushbutton once. This will bring you to the main setup menu where you can use the toggle switch to move up and down the list of available sub menus. An arrow (>) moves up and down the left hand side of the menu items to indicate which item you are currently choosing. Once the arrow is on the desired item, press the pushbutton to select the next menu level.

On all menus, there are two extra selectable items: *Back* and *Exit*. Selecting *Back* will take you to the previous menu (the one that was used to get into the current menu) while *Exit* will return the display to its normal operating mode. On the main menu, BACK and EXIT will both take you to the normal operating mode.

Once in a sub menu, there may be another menu layer, or there may be a list of parameters to adjust. If there is another set of menu choices, use the toggle switch to select the desired menu item and press the pushbutton.

To adjust any parameter, use the toggle switch to move up or down to the desired parameter and press the pushbutton. The arrow will move to the right hand side of the line (<) indicating that you can now adjust the parameter. Using the toggle switch, adjust the parameter to its desired value. If the parameter is a numerical value, the number will increase if you lift the toggle switch and decrease if you push down on the toggle switch. If the parameter contains a list of choices, you can cycle through the list by pressing the toggle switch in either direction.

When you have stopped at the desired value, depress the pushbutton. This will update the parameter to the selected value and move the arrow back to the left side of the parameter list (>). Continue selecting and adjusting other parameters or use the BACK or EXIT commands.

5.2.   CHANGING TEXT FIELDS

Some of the controls of the OSD menu allow you to adjust a text-based field. Editing a line of text can be a little tedious with a toggle switch and a pushbutton, but it can be done with the following procedure:

1.   Select the text to edit by pressing the pushbutton when the menu item is selected. This will take you to a screen that has the label/name of the text being edited and a white box. The white box contains the text to change and is drawn to the maximum size of the text field.
         SAMPLE TEXT
         ^
         Note the arrow (^) under the character. This indicates which character you will be changing with the toggle switch.

2.   Use the toggle switch to change the first character of the text message.

3.　　Once you have selected the desired character, press the pushbutton. This will advance the arrow to the next character. Continue changing the remainder of the characters in the same way.

4.　　There are two special characters to help you enter the text: a backspace character (left pointing arrow), and an end of line character (stop sign):

Left Arrow: If you have accidentally advanced to the next character and want to go back, select the left arrow with the toggle switch. When you press the pushbutton, you will go back to the previous character. This will save you from having to complete the editing and re-edit it to change the mistake.

Stop sign: If you are done changing the text, and the new text is shorter than old text, you can terminate the line with a stop sign. When you use the pushbutton after selecting the stop sign, any remaining characters in the text field will be erased and you will return to the menu structure.

You are done editing when you reach the end of the field (maximum length), or you select the stop sign and press the pushbutton.

5.3.　ON SCREEN DISPLAY – MAIN MENU

Video	Control for video processing operation
Decoder Setup	Control for decoding EIA-608, EIA-708 Captions, and the Status display
608-708 Translator	Options to map CC and text channels to EIA-708 standard.
Fault configuration	Definition of the fault conditions. Configuration of the fault message windows.
Serial Link Setup	RS232 Serial output setup
Utilities	Options for storing and recalling presets, firmware version and upgrade, and factory reset.

The OSD menu is arranged in a layered structure that groups similar configuration items together. The following section gives a brief description of the first level of menus that appear when you enter the OSD screens. Selecting one of these items will take you to the next menu level

5.4.　CONFIGURING THE VIDEO CONTROLS

The *Video* menu is used to configure parameters associated with the video input and output features.

SD Video	Selects the SD-SDI input video standard
HD Video	Selects the HD-SDI input video standard

5.4.1.　Setting the SD-SDI Video Standard

Video	The SD-SDI input video standard is selected with this control.

SD Video
525

5.4.2. Setting the HD-SDI Video Standard

Video
HD Video
720p/59.94
1080i/59.94

The HD-SDI input video standard is selected with this control

5.5. CONFIGURING THE DECODER

The Decoder Setup menu allows the user to select the decoder output of the 7760CCM-HD.

Display Select	Selects the information that will be displayed On Screen
EIA-608 Decoder	Configures the EIA-608 decoder display
EIA-708 Decoder	Configures the EIA-708 decoder display
Status Disp	Displays the Status of the selected Faults

5.5.1. Setting the Decoder Display output

Decoder Setup
Display Select
Off
EIA-608 Decoder
EIA-708 Decoder
Status Display

Select one of the four display options:
The EIA-608 Decoder is configured under the EIA-608 Decoder menu outlined under section 5.5.2
The EIA-708 Decoder is configured under the EIA-608 Decoder menu outlined under section 5.5.3
The Status Display is configured under the Status Disp menu outlined under section 5.5.10

5.5.2. Configuring the EIA-608 Decoder Closed Caption Channel

Decoder Setup
   EIA-608 Decoder
     CC Channel
       1 to 4
       Off

Selects the EIA-608 caption channel that the decoder will decode. Channels 1 through 4 can be selected or the function can be turned off.

5.5.3. Configuring the EIA-608 Decoder Text Channel

Decoder Setup
   EIA-608 Decoder
     Text Channel
       1 to 4
       Off

Selects the EIA-608 text channel that the decoder will decode. Channels 1 through 4 can be selected or the function can be turned off.

5.5.4. Configuring the EIA-608 Decoder Text window position

Decoder Setup
   EIA-608 Decoder
     Text Top Row
       1-15

This feature allows the user to anchor the position of the Text Window displayed on the OSD.

5.5.5. Configuring the EIA-608 Decoder Text window Height

Decoder Setup
   EIA-608 Decoder
     Text Height
       2-15

Allows the user to select the height of the Text Window displaying the Text Channel information on the OSD

5.5.6. Configuring the EIA-608 Decoder XDS Window Display type

Decoder Setup
   EIA-608 Decoder
     XDS Display
       Fixed Position
       Scrolling Display
       Off

The information display of the XDS window can be configured three different ways. Fixed position window is at a constant height and will display the XDS information within the selected area.
Scrolling Display will display the XDS information as it is received by the car.
Selecting Off will disable the XDS feature

5.5.7. Configuring the EIA-608 Decoder XDS Anchor point

Decoder Setup
   EIA-608 Decoder
     XDS Top Row
       1-15

This feature allows the user to anchor the position of the XDS Window displayed on the OSD.

evertz

5.5.8. Configuring the EIA-608 Decoder XDS Window height

```
Decoder Setup
  EIA-608 Decoder
    XDS Height
      2-15
```

Allows the user to select the height of the XDS Window displaying the XDS information on the OSD

5.5.9. Configuring the EIA-708 Decoder Channel Select

```
Decoder Setup
  EIA-708 Decoder
    CC Service
    Channel
      1 - 63
```

This allows the user to select the EIA-708 CC service to be decoded. Services 1 through 63 can be selected.

5.5.10. Configuring the Status Display

```
Decoder Setup
  Status Disp
    SMPTE 333M Faults
```

The Status Disp menu allows the user to configure the Faults that will be displayed in the Status Display Window. Currently, the 7760CCM-HD only displays SMPTE 333M faults

5.6. CONFIGURING THE 608-708 TRANSLATOR

The 608-708 Translator menu is used to configure parameters associated with the EIA-608 to EIA-708 translator.

```
608/708 Delay Queue

CC/Text Channel
```

Allows the user to add delay to the captions between the 608 to 708 translation process
Configures which EIA-608 channels to trans

5.6.1. Configuring the 608-708 delay Queue

```
608-708 Translator
  608/708 delay queue
    0 frames
    1-30
```

Configures the number of frames of delay introduced when translating captions from EIA-608 to EIA-708

5.6.2. Defining 608 to 708 translation

```
608-708 Translator
  CC/Text Channel
    CC1
      Disable
      1-63
```

The CC/Text Channel parameter allows the user to select which EIA-708 service the EIA-608 CC or Text channels will be mapped to. Services 1 through 63 are available. For simplicity, only CC1 is shown. CC2 to CC4 and Text 1 to Text 4 are configured the same.

5.7. FAULT CONFIGURATION PARAMETERS

Fault Condition 1	Configures the parameters that will enable Fault Conditions
Fault Condition 2	Configures the parameters that will enable Fault Conditions
Fault Condition 3	Configures the parameters that will enable Fault Conditions
Fault Condition 4	Configures the parameters that will enable Fault Conditions

5.7.1. Configuring Fault Condition 1 Video Absent

Fault Configuration
   Fault Definition 1
      Video Absent
         Enable
         Disable

Enabling this parameter will trigger Fault Definition 1 when video is absent upstream to the 7760CCM-HD. Select Disable to turn this feature off. Fault Conditions two, three, and four are configured the same way as Fault Condition 1.

5.7.2. Configuring Fault Condition 1 CC Waveform Absent

Fault Configuration
   Fault Definition 1
      CC Waveform Absent
         Enable
         Disable

Enabling this parameter will trigger Fault Definition 1 when Closed Captions are not present in the upstream SD-SDI or HD-SDI video. Select Disable to turn this feature off. Fault Conditions two, three, and four are configured the same way as Fault Condition 1.

5.8. CONFIGURING THE SERIAL LINK SETUP

Serial Link Setup
   Off
   SMPTE 333M
   Grand Alliance

The Serial output of the 7760CCM-HD can be configured for either SMPTE 333M or Grand Alliance protocols. Please ensure the Serial Link setting is configured properly to communicate with your ATSC encoder. Selecting Off will disable RS232 communication.

5.9. USING THE 7760CCM-HD UTILITIES

The tools in the utilities menu allow the user gather, save, and restore information and configurations for the 7760CCM-HD card.

About...	Provides information about your 7760CCM-HD card
Store Presets 1 through 4	Stores the configurations of the 7760CCM-HD card
Recall Presets 1 through 4	Configures the parameters that will enable Fault Conditions

Upgrade	
Factory Reset	Configures the parameters that will enable Fault Conditions

5.9.1. Using the About Parameter

Utilities	The About prameter provides information about the card regarding
About...	Software version, Hardware version, and Serial Number.

5.9.2. Storing Presets

Utilities	This feature allows the user to store the current settings of the
Store Preset 1	7760CCM-HD card. These presets can be recalled at any time using
Store	the Recall Preset function.
Cancel	Presets 2 through 4 are stored the same way as Preset 1

5.9.3. Recalling Presets

Utilities	This feature allows the user to recall the stored settings of the
Recall Preset 1	7760CCM-HD card. These presets are stored using the Store preset
Recall	function.
Cancel	Presets 2 through 4 are recalled the same way as Preset 1

5.9.4. Card edge Upgrade

Utilities	This feature allows the user to upgrade the firmware of the unit without
Upgrade	removing it from the frame. Select Yes to begin the upgrade procedure.
Yes	Please see section 8.1.2 for detailed upgrade instructions.
Cancel	

5.9.5. Card edge Upgrade

Utilities	This feature re-configures all parameters to default factory settings.
Factory Reset	Please note all card configuration will be lost
Yes	
Cancel	

6.   DIP SWITCH CONTROL

6.1.   DIP SWITCH SETTINGS

The 7760CCM-HD has dip switches located near the card edge. Dip switch 1 is used to control the OSD (on screen display) of the monitoring output. Assure this DIP switch is set to the closed (down) position to enable the OSD. DIP switches 5,6,7, and 8 are used when setting changes are made via the card edge RS232 communication port. This is not required as the monitoring OSD allows the user to change all the configuration settings.

DIP SWITCH				Function	Options	
1	**2**	**3**	**4**			
up	up	up	up	none	none	
down	up	up	up	Enables On Screen Display		
5	**6**	**7**	**8**			
up	up	up	up	none	none	
up	up	up	down	HD Video Standard	1080i/60 **1080i/59.94** 1080i/50 1080p/30 1080p/29.97 1080p/25	1080p/24 1080p/23.98 720p/60 720p/59.94 1035i/60 1035i/59.94
up	up	down	up	CC1 to EIA-708 Service Number	off, **1..63**	
up	up	down	down	CC2 to EIA-708 Service Number	**off**, 1..63	
up	down	up	up	CC3 to EIA-708 Service Number	**off**, 1..63	
up	down	up	down	CC4 to EIA-708 Service Number	**off**, 1..63	
up	down	down	up	T1 to EIA-708 Service Number	**off**, 1..63	
up	down	down	down	T2 to EIA-708 Service Number	**off**, 1..63	
down	up	up	up	T3 to EIA-708 Service Number	**off**, 1..63	
down	up	up	down	T4 to EIA-708 Service Number	**off**, 1..63	
down	up	down	up	608-to-708 delay	0..31 frames	
down	up	down	down	RS-232 Serial Link Setup	off **SMPTE-333M** Grand Alliance	
down	down	up	up	none	none	
down	down	up	down	none	none	
down	down	down	up	none	none	
down	down	down	down	none	none	

> **PLEASE ENSURE DIP SWITCH 1 IS IN THE DOWN (CLOSE) POSITION IN ORDER TO ENABLE THE ON SCREEN DISPLAY**

6.2. CHANGING PARAMETERS USING THE DIP SWITCHES

1.Set DIP switch 1 to the open position.

2.Using the WPCCMTIO cable, connect DB15 on rear panel of 7760CCM-HD to the SMPTE-333M caption ingest port on the ATSC encoder. The pin-out of the DB9M is DTE. The null-modem cable is also required for some ATSC encoders, to convert the pin-out to DCE.

3. Connect HD-SDI video to the SDI INPUT BNC connector on the rear panel of 7760CCM-HD. Note that the video outputs of 7760CCM-HD are not yet functional.

4. Connect the 6-way ribbon cable from J24 (debug serial port) on the 7760CCM-HD card to an available RS-232 serial COM port on the PC.

5. On the PC, run a serial terminal program such as HyperTerminal to communicate with the 7760CCM-HD. COM setup is: 57,600 baud, 8 data bits, NO parity bits, 1 stop bit, NO flow control.

6. Apply +12V power to the 7760CCM-HD. You will see text appear in the terminal window similar to:

```
EVERTZ MCF5407 MONITOR 2.5 BUILD 9
COPYRIGHT 1997, 1998, 1999, 2000, 2001, 2002 EVERTZ MICROSYSTEMS LTD.
28F160C3B FLASH DETECTED
MCF5407 COLD BOOT> BOOTING...
(A)7700PH3 7760CCM-HD hardware build 1, S/N 0000000000.
7760CCM-HD software v1.00 build 1
Load virtex
Reset virtex
Init virtex
Init presets
Preset version is 0
Enable interrupts
Initialize UI
```

Use DIP5 to DIP8 to select the desired parameter. Use the DIP switch table on the previous table to select the parameters that need to be changed.
Use toggle switch to select desired option. The parameter will appear on the terminal program.
Use pushbutton to remind you what the parameter is set to.

7. JUMPERS

7.1. SELECTING WHETHER LOCAL FAULTS WILL BE MONITORED BY THE GLOBAL FRAME STATUS

The FRAME STATUS jumper J22 determines whether local faults (as shown by the Local Fault indicator) will be connected to the 7700FR frame's global status bus.

FRAME STATUS   To monitor faults on this module with the frame status indicators (on the Power Supply FRAME STATUS LED's and on the Frame's Fault Tally output) install this jumper in the On position. (Default)

When this jumper is installed in the Off position local faults on this module will not be monitored.

7.2. SETTING THE 7760CCM-HD INTO RUN AND UPGRADE MODE

RUN/UPGRADE   The Run/Upgrade jumper is set to Run during normal operation of the card. When the firmware needs to be upgraded, the jumper is set to the upgrade mode. Please see section 8 for instructions on how to upgrade firmware.

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8. FIRMWARE UPGRADE

8.1. FIRMWARE UPGRADE

1. Connect the 6-way ribbon cable from J24 (debug serial port) on the 7760CCM-HD card to an available RS-232 serial COM port on the PC.

2. On the PC, run a serial terminal program such as HyperTerminal to communicate with the 7760CCM-HD. COM setup is: 57,600 baud, 8 data bits, NO parity bits, 1 stop bit, NO flow control.

8.1.1. Upgrading using the Run/Upgrade Jumper

3. Set the Upgrade/Run Jumper to Upgrade. Power the unit.
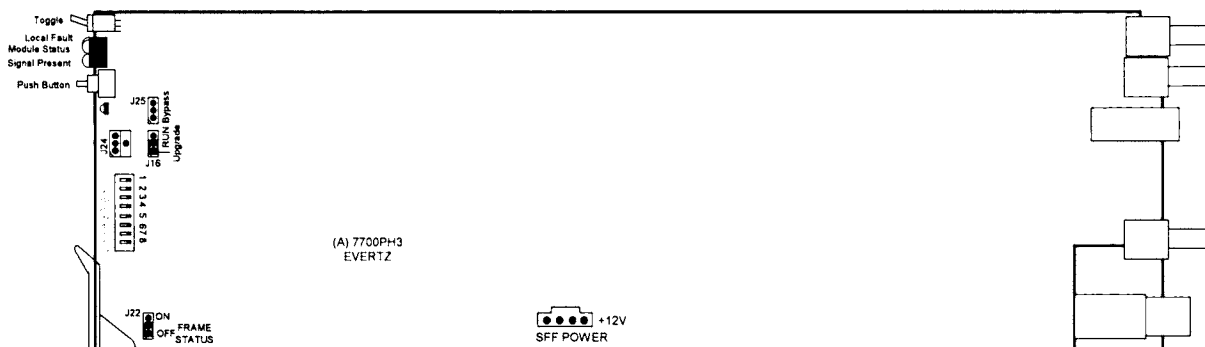
4. You will see this prompt appear on the terminal program:

EVERTZ MCF5407 MONITOR 2.5 BUILD 9
COPYRIGHT 1997, 1998, 1999, 2000, 2001, 2002 EVERTZ MICROSYSTEMS LTD.
28F160C3B FLASH DETECTED
BRD=7700PH3
MODEL=BA7700PH3-CCMHD
PROD=7760CCM-HD
FRAME=7700FR
UPGRADE JUMPER INSTALLED

UPLOAD FILE NOW, CONTROL-X TO CANCEL

5. Send the .bin file to the 7760CCM-HD using the **Xmodem** protocol.

6. After the file is uploaded into the 7760CCM-HD, set the Upgrade/Run jumper back to the Run position and power cycle the unit.

8.1.2. Upgrading using the OSD Menu

The unit does not need to be powered down for this method of upgrade

Select the Upgrade sub-menu under the Utilities menu and select YES to begin upgrade. See section 5.9.4.

You will see this prompt appear on the terminal program:

EVERTZ MCF5407 MONITOR 2.5 BUILD 9
COPYRIGHT 1997, 1998, 1999, 2000, 2001, 2002 EVERTZ MICROSYSTEMS LTD.
28F160C3B FLASH DETECTED
BRD=7700PH3
MODEL=BA7700PH3-CCMHD
PROD=7760CCM-HD

FRAME=7700FR
UPGRADE JUMPER INSTALLED

UPLOAD FILE NOW, CONTROL-X TO CANCEL

Send the .bin file to the 7760CCM-HD using the **Xmodem** protocol.

After the file is uploaded, the upgrade is complete.

9. MENU QUICK REFERENCE

VIDEO
    SD Video
        525
    HD Video
        720p/59.94
        1080i/59.94

DECODER SETUP
    Display Select
        Off
        EIA-608 Decoder
        EIA-708 Decoder
        Status Display
    EIA-608 Decoder
        CC channel
            1 to 4
            Off
        Text Channel
            1 to 4
            Off
        Text Top Row
            1 – 15
            6
        Text Height
            2 – 15
            5
        XDS Display
            Fixed Position
            Scrolling Display
            Off
        XDS Top row
            1 – 15 **(1)**
        XDS Height
            2 – 15 **(5)**
    EIA-708 Decoder
        CC service Channel
            1 – 63
    Status Disp
        SMPTE 333M Faults

608-708 TRANSLATOR
    608/708 delay queue
        0 Frames
        1 - 30
    CC/TEXT Channel
        CC1
            Disable
            1 - 63
        CC2
            Disable
            1 - 63
        CC3
            Disable
            1 - 63
        CC4
            Disable
            1 - 63
        T1
            Disable
            1 - 63

        T2
            Disable
            1 - 63
        T2
            Disable
            1 - 63
        T3
            Disable
            1 - 63
        T4
            Disable
            1 – 63

FAULT CONFIGURATION
    Fault condition 1
        Fault definition 1
            Video absent
                Enable
                Disable
            CC waveform absent
                Enable
                Disable

    Fault Condition 2 (*same as Fault Condition 1*)
    Fault Condition 3 (*same as Fault Condition 1*)
    Fault Condition 4 (*same as Fault Condition 1*)

SERIAL LINK SETUP
    Off
    SMPTE 333M
    Grand Alliance

UTILITIES
    About...
    Store preset 1
        Store
        Cancel
    Store preset 2
        Store
        Cancel
    Store preset 3
        Store
        Cancel
    Recall preset 1
        Load
        Cancel
    Recall preset 2
        Load
        Cancel
    Recall preset 3
        Load
        Cancel
    Upgrade
        Yes
        Cancel
    Factory reset
        Yes
        Cancel

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10. *VISTA*LINK™ REMOTE MONITORING/CONTROL

10.1. WHAT IS *VISTA*LINK™?

*Vista*LINK™ is Evertz's remote monitoring and control capability over an Ethernet network using Simple Network Management Protocol (SNMP). SNMP is a standard computer network protocol that enables different devices sharing the same network to communicate with each other. For monitoring, there needs to be a detecting device that automatically reports all errors to a central alarm and error logging station. We also need to be able to interrogate individual detector devices from the central station to determine the status of individual channels. Finally, we need to be able to configure devices in the network from the central station and receive feedback that the configuration has been carried out.

There are 3 components of SNMP:

1. An SNMP manager also known as a Network Management System (NMS) is a computer running special software that communicates with the devices in the network. Evertz VL-Fiber demo Manager graphical user interface (GUI), third party or custom manager software may be used to monitor and control Evertz *Vista*LINK™ enabled fiber optic products.

2. Managed devices (such as 7707IT cards), each with a unique address (OID), communicate with the NMS through an SNMP Agent. Evertz *Vista*LINK™ enabled 7700 series modules reside in the 3RU 7700FR-C MultiFrame and communicate with the manager via the 7700FC *Vista*LINK™ frame controller module, which serves as the Agent.

3. A virtual database known as the Management information Base (MIB) lists all the variables being monitored and which both the Manager and Agent understand. Please contact Evertz for further information about obtaining a copy of the MIB for interfacing to a third party Manager/NMS.

For more information on connecting and configuring the *Vista*LINK™ network, see the 7700FC Frame Controller chapter.

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11. GLOSSARY

11.1. GLOSSARY OF STANDARDS

EIA (Electronic Industries Alliance): An association of trade associations representing various facets of the electronics industry. Each of these EIA Sector Associations manages its own standards-setting programs under EIA, the umbrella organization.

EIA-608-B: This EIA standard serves as a technical guide for those providing encoding equipment and/or decoding equipment to produce material with encoded data embedded in Line 21 of the vertical blanking interval of the NTSC video signal. It is also a usage guide for those who will produce material using such equipment

EIA-708-B defines the coding of DTV closed captions (DTVCC) as they are delivered in an ATSC signal, and also defines the Caption Distribution Packet (CDP). This structure contains fields that can hold: EIA-608-B data for use if the video is converted to standard definition analog; DTV captions for use in an ATSC program; Caption Descriptors; and Time Code. The CDP is the basic unit of data that is transported through the professional portion of a DTV plant. As such, it is central to the methods discussed in this document.

EIA-744-A: The EIA standard that defines the formatting of content advisory information accommodating either U.S. or Canadian systems, as well as the movie industry's MPAA rating system using the vertical blanking interval. EIA 744-A redefines the XDS Program Rating (content advisory) packet, 05h, currently contained in **EIA-608-B**, section 6.5.1, Current Class.

EIA-746-A: This document is a proposed amendment to EIA-608-A to insert Internet Uniform Resource. Locators (URLs) within the line-21 data system using the Text-2 (T-2) service. These URLs may be used by receiving devices in a variety of ways to associate Internet content with related television broadcast content

SMPTE (Society of Motion Picture and Television Engineers): A professional organization that recommends standards for the film and television industries.

SMPTE 12M: The SMPTE standard for linear time code.

SMPTE 125M: The SMPTE standard for bit parallel digital interface for component video signals. .SMPTE 125M defines the parameters required to generate and distribute component video signals on a parallel interface.

SMPTE 244M: The SMPTE standard for bit parallel digital interface for composite video signals. SMPTE 244M defines the parameters required to generate and distribute composite video signals on a parallel interface.

SMPTE 259M: The SMPTE standard for 525 line serial digital component and composite interfaces.

SMPTE 269M: This SMPTE standard defines an opto-isolated fault tally output signal for connecting to.user-defined equipment such as warning indicators.

SMPTE 291M: defines the method of multiplexing ancillary data such as audio and captions to 292M and 259M signals.

SMPTE 292M: defines the serial interface that is used for carriage of HDTV video signals. It and its standard definition equivalent 259M provide a standard transport mechanism, not only for the video signal, but also for digitized audio and data such as captions.

SMPTE 309M: The SMPTE standard for encoding date information into the user bits of linear time code.

SMPTE 333M: The SMPTE standard for serially interfacing captioning equipment with ATSC caption encoders

SMPTE 334M: assigns addresses to be used to multiplex specific data services such as captioning into the vertical ancillary (VANC) space defined by 291M. It also specifies that the payload of a VANC packet used for captioning is CDP.

11.2. GLOSSARY OF TERMS

AES: (Audio Engineering Society): A professional organization that recommends standards for the audio industries.

AES/EBU: Informal name for a digital audio standard established jointly by the Audio Engineering Society and the European Broadcasting Union organizations.

ANALOG: An adjective describing any signal that varies continuously as opposed to a digital signal that contains discrete levels representing digits 0 and 1.

A-TO D CONVERTER (ANALOG-TO-DIGITAL): A circuit that uses digital sampling to convert an analog signal into a digital representation of that signal.

ATSC A/65: defines information that describes the contents of an ATSC broadcast. Some of this information may pertain to the closed captioning.

BIT: A binary representation of 0 or 1. One of the quantized levels of a pixel.

BIT PARALLEL: Byte-wise transmission of digital video down a multi-conductor cable where each pair of wires carries a single bit. This standard is covered under SMPTE 125M, EBU 3267-E and CCIR 656.

BIT SERIAL: Bit-wise transmission of digital video down a single conductor such as coaxial cable. May also be sent through fiber optics. This standard is covered under SMPTE 259M and CCIR 656.

BIT STREAM: A continuous series of bits transmitted on a line.

BNC: Abbreviation of "baby N connector". A cable connector used extensively in television systems.

BYTE: A complete set of quantized levels containing all the bits. Bytes consisting of 8 to 10 bits per sample are typical in digital video systems.

CABLE EQUALIZATION: The process of altering the frequency response of a video amplifier to compensate for high frequency losses in coaxial cable.

CDP: caption distribution Packet, defined in EIA-708.

CCIR (International Radio Consultative Committee): An international standards committee. (This organization is now known as ITU.)

CCIR-601: See ITU-R601

CCIR-656: See ITU-R656

CLIFF EFFECT: (also referred to as the 'digital cliff') This is a phenomenon found in digital video systems that describes the sudden deterioration of picture quality when doe to excessive bit errors, often caused by excessive cable lengths. The digital signal will be perfect even though one of its signal parameters is approaching or passing the specified limits. At a given moment however, the parameter

will reach a point where the data can no longer be interpreted correctly, and the picture will be totally unrecognizable.

COMPONENT ANALOG: The non-encoded output of a camera, video tape recorder, etc., consisting of the three primary colour signals: red, green, and blue (RGB) that together convey all necessary picture information. In some component video formats these three components have been translated into a luminance signal and two colour difference signals, for example Y, B-Y, R-Y.

COMPONENT DIGITAL: A digital representation of a component analog signal set, most often Y, B-Y, R-Y. The encoding parameters are specified by ITU-R601. ITU-R656 and SMPTE 125M specify the parallel interface.

COMPOSITE ANALOG: An encoded video signal such as NTSC or PAL video, that includes horizontal and vertical synchronizing information.

COMPOSITE DIGITAL: A digitally encoded video signal, such as NTSC or PAL video that includes horizontal and vertical synchronizing information.

D1:   A component digital video recording format that uses data conforming to the ITU-R601 standard. Records on 19 mm magnetic tape. (Often used incorrectly to refer to component digital video.)

D2:   A composite digital video recording format that uses data conforming to SMPTE 244M. Records on 19 mm magnetic tape. (Often used incorrectly to refer to composite digital video.)

D3:   A composite digital video recording format that uses data conforming to SMPTE 244M. Records on 1/2" magnetic tape.

DSO:(Daylight Saving time Observed)

DST (DAYLIGHT SAVING TIME): The civil time observed when daylight saving time is adopted in a country or region. It is usually standard time + 1 hour. (see also *Standard Time*)

DTVCC: Digital Television Closed Captioning, defined in EIA-708.

EBU (European Broadcasting Union):   An organization of European broadcasters that among other activities provides technical recommendations for the 625/50 line television systems.

EBU TECH 3267-E: The EBU recommendation for the parallel interface of 625 line digital video signal. This is a revision of the earlier EBU Tech 3246-E standard that was in turn derived from ITU-R601.

EDH: Error Detection and Handling (EDH) is defined in SMPTE RP-165 as a method of determining when bit errors have occurred along the digital video path. Check words and flags are combined into a special error detection data packet that is included as ancillary data in the serial digital signal.

EMBEDDED AUDIO: Digital audio is multiplexed onto a serial digital video data stream.

EXTENDED DATA SERVICES (XDS):   XDS is a third data service in field 2 that is intended to supply program related and other information to the viewer. This information may include such items

as program title, length of show, type of show and program content codes such as V-Chip program ratings.

ITU: The United Nations regulatory body governing all forms of communications. ITU-R (previously CCIR) regulates the radio frequency spectrum, while ITU-T (previously CCITT) deals with the telecommunications standards.

ITU-R601: (This document previously known as CCIR-601). An international standard for component digital television from which was derived SMPTE 125M and EBU 3246-E standards. ITU-R601 defines the sampling systems, matrix values and filter characteristics for both Y, B-Y, R-Y and RGB component digital television signals.

ITU-R656 (This document previously known as CCIR-656). The physical parallel and serial interconnect scheme for ITU-R601. ITU-R656 defines the parallel connector pinouts as well as the blanking, sync and multiplexing schemes used in both parallel and serial interfaces. It reflects definitions found in EBU Tech 3267 (for 625 line systems) and SMPTE 125M (parallel 525 line systems) and SMPTE 259M (serial 525 line systems).

JULIAN DATE: The Julian day number is a count of days elapsed since Greenwich mean noon on January 1, 4713B.C. January 1st, 1993 was JD 2448989; January 1st, 2000 was JD 2451545.

MODIFIED JULIAN DATE (MJD): The Modified Julian Date is a continuous count of the number of days elapsed since 17 November 1858. It is often more useful than conventional calendar dates for record keeping over long periods of time, since the MJD's of two events can easily be subtracted to determine the time difference in days. Usually, the MJD is specified as a number with 5 significant digits. As an example, the MJD for 1 January 1995 is 49718, meaning that this many days have elapsed between 17 November 1858 and 1 January 1995. The Modified Julian date is calculated by subtracting 2400000.5 days from the Julian Date. Thus the Modified Julian Day 1 begins at Greenwich midnight.

LED: Light Emitting Diode.

LINEAR TIME CODE (LTC): A digital code used for timing and control purposes on videotape and associated audiotape machines. It is recorded on a longitudinal track with audio characteristics and is referred to as LTC (Sometimes this code is also referred to as longitudinal code or SMPTE). Each 80 bit code word is associated with one television frame, and consists of 26 time bits, 6 flag bits, 32 user bits and 16 sync bits. Date information may optionally encoded into the user bits. This code is often used for distribution time of day information to station clock displays and automation systems. The SMPTE 12M standard defines LTC.

PAC: stands for Preamble Address Code. These codes are embedded into the line 21 caption data. They define the caption text position on the screen, and set special features such as colour, italics and underline.

PIXEL: The smallest distinguishable and resolvable area in a video image. A single point on the screen. In digital video, a single sample of the picture. Derived from the words *picture element.*

PSIP: Program and System Information Protocol, defined in ATSC A/65.

RESOLUTION: The number of bits (eight, ten, etc.) determines the resolution of the signal. Eight bits is the minimum resolution for broadcast television signals.

SERIAL DIGITAL (SDI):   Digital information that is transmitted in serial form. Often used informally to refer to serial digital television signals.

STANDARD TIME: The civil time adopted for a country or region. (See also *Daylight Saving Time*)

TIME ZONE OFFSET: The difference in time between the local time and UTC

TRS: Timing reference signals used in composite digital systems.
(It is four words long).

TRS-ID: Abbreviation for "Timing Reference Signal Identification". A reference signal used to maintain timing in composite digital systems. (It is four words long.)

UNIVERSAL COORDINATED TIME
UNIVERSAL TIME, COORDINATED (UTC): Universal Coordinated Time (UTC) is an international time standard that defines a time that doesn't depend on where we are on Earth. Universal Time (UTC), Greenwich Mean Time (GMT), and Zulu Time (Z), are based at the prime meridian (0° longitude) of Earth and are used to avoid confusion of time zones.

VANC: Vertical Ancillary data. Data carried in serial digital video signal (SMPTE 259M or 292M), in accordance with SMPTE 291M, in the active portion of scan lines that are outside the active picture area.

VBI: Vertical Blanking Interval. The scan lines that are outside the active picture area of a standard definition video signal (analog or serial digital). These can be used for carriage of data, including closed captioning, in analog video broadcasting.

V-Chip: Abbreviation for "Viewer Chip" (commonly misread as "Violence Chip"). V-Chip-enabled television sets extract Program Rating packets from the XDS data stream in Field 2 captions to determine the rating of a show. Also see Extended Data Services.

WebTV: The encoding of URL (Uniform Resource Locators) normally used on the Internet, into line 21 caption style data. This URL string is made up with the familiar http:// followed by a target location on the Internet. The URL must be formatted to match the Electronic Industries Association specification EIA-746-A.

XDS: See Extended Data Services.

4:2:2 A commonly used term for a component digital video format. The details of the format are specified in the ITU-R601 standard. The numerals 4:2:2 denote the ratio of the sampling frequencies of the luminance channel to the two colour difference channels. For every four luminance samples, there are two samples of each colour difference channel.

4Fsc Four times subcarrier sampling rate used in composite digital systems. In NTSC this is 14.3 MHz. In PAL this is 17.7 MHz